

OFFICIAL

ARMY INFORMATION DIGEST

U. S. ARMY MAGAZINE

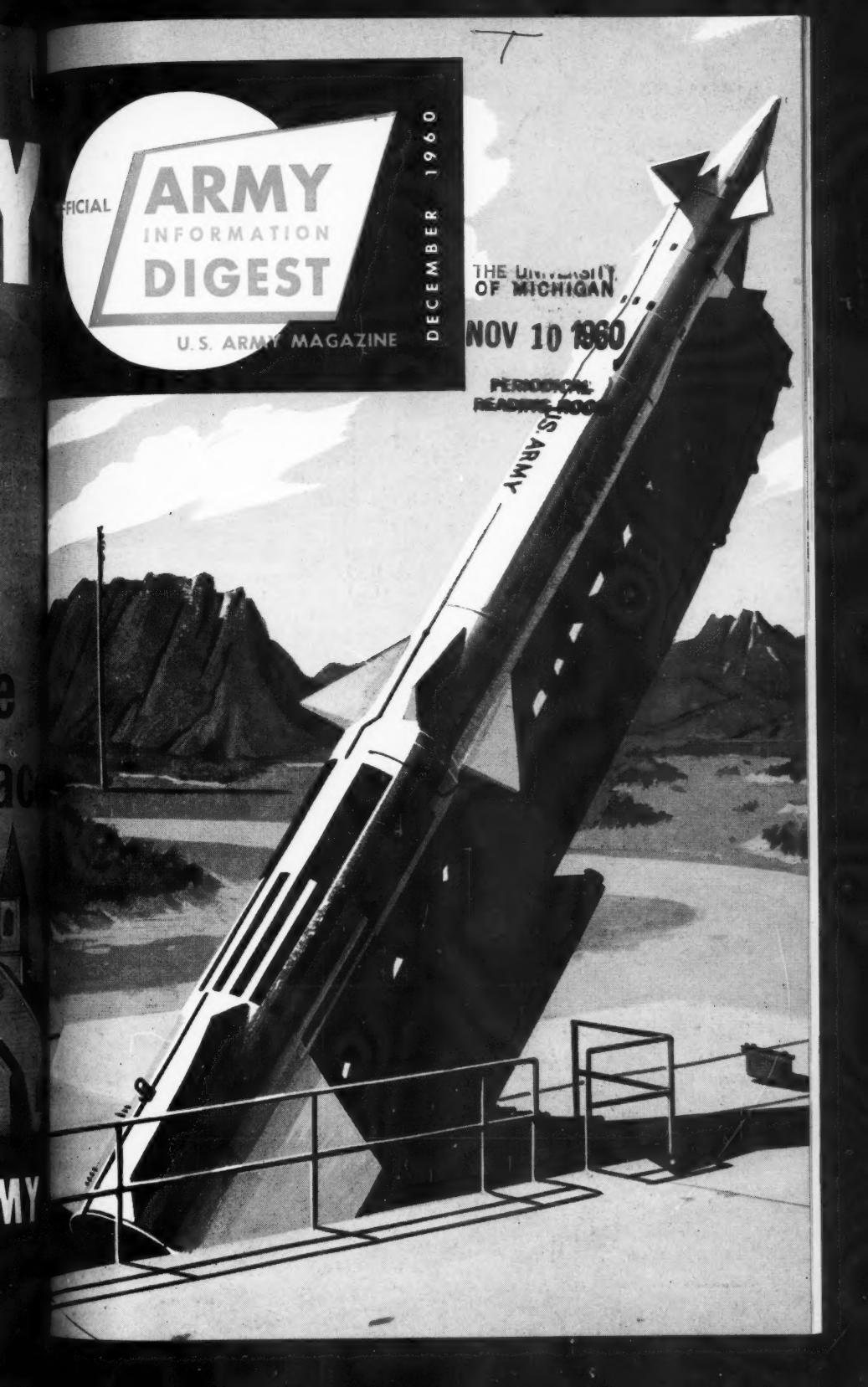
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U. S. ARMY



ARMY INFORMATION DIGEST



THE OFFICIAL MAGAZINE OF THE DEPARTMENT OF THE ARMY

The mission of ARMY INFORMATION DIGEST is to keep personnel of the Army aware of trends and developments of professional concern.

The Digest is published under supervision of the Army Chief of Information to provide timely and authoritative information on policies, plans, operations, and technical developments of the Department of the Army to the Active Army, Army National Guard, and Army Reserve. It also serves as a vehicle for timely expression of the views of the Secretary of the Army and the Chief of Staff and assists in the achievement of information objectives of the Army.

Manuscripts on subjects of general interest to Army personnel are invited. Direct communication is authorized to: Editor, Army Information Digest, Cameron Station, Alexandria, Va.

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COVERS: Designed for instant intercept of ICBMs hurtling at multi-Mach speeds toward vital targets, the Nike-Zeus is the refined third generation of the Nike family which will shortly undergo further tests of its super-speed kill-ability on Atlantic and Pacific Missile Ranges.

COMMAND LINE

Index to Volume 15 will appear in January 1961 issue

ON THE AMERICA WE WANT

"I want an America whose citizens understand the true meaning of freedom. The freedom we cherish is not passive freedom from something—from want, or fear, or trouble, or injustice—but dynamic, indivisible freedom for something—freedom to work out our own destiny according to the pattern of our own minds, and the strength of our own dedication—freedom to help build a better world.

"I want an America made up of people who recognize that the security of the Nation is the responsibility of each individual citizen—not just in some figurative sense, but in actual, grim reality. In order to preserve our freedom, we must prove that a free people can, through voluntary effort, continue to accomplish even more than the regimented society of the Soviet Union.

"The Soviet system requires people who can be managed. In contrast, a free society requires people who are capable of managing themselves. We must not allow the desire for comfort and convenience in any aspect of life to assume greater influence in our plans and activities than the desire to protect our way of life faithfully and well.

"I want an America whose citizens possess good, old-fashioned moral courage. It is not enough to have convictions; one must have the courage to defend those convictions. The most coward's motto is: 'Don't stick your chin out.' The courageous person—the person who really counts for America—when convinced of the righteousness of a cause stands firm, no matter what the cost. We must be a Nation of tough-minded people with the hardy moral fiber that will not give an inch to the provocations of international gangsterism.

"We fervently hope that the growth and fruition of ideals in the hearts of men will bring the day when accepted standards of national morality will prevail in the Communist world, but until that day dawns, our only salvation is to be ready and willing to confront force with force under any circumstances."

Secretary of the Army Wilber M. Brucker,
in an international short-wave address,
Lansing, Michigan, 10 June 1960.

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THE OFFICIAL

ARMY
INFORMATION
DIGEST

U. S. ARMY MAGAZINE

DECEMBER 1960

To counter the long-range

missile threat,

the Army counts on

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U.S. ARMY



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ZEUS

Our Developing Missile Killer

Colonel John G. Zierdt

"Our Nation needs an active defense against the inter-continental ballistic missile. . . .

"I firmly believe the first country to achieve a practical defense against ballistic missiles will gain not only a tremendous psychological advantage but more importantly a very great military advantage."

*Secretary of the Army Wilber M. Brucker
before the Association of the U. S. Army,
Washington, D. C., 8 August 1960.*

ONLY a few years ago many Americans were assuming that the Intercontinental Ballistic Missile was an "ultimate weapon" against which the only defense was

COLONEL JOHN G. ZIERDT, *Ordnance Corps, is Commander, Army Rocket and Guided Missile Agency, Redstone Arsenal, Alabama.*

the threat of retaliation with our own nuclear-tipped missiles. Possession of a mutual capability to inflict mass destruction is, of course, a main and necessary element of deterrence. Imagine, however, the great advantage this Nation would have if it possessed both the ICBM

Nike-Zeus—Missile Killer

for retaliation and a defense weapon that could knock down ICBMs fired by an aggressor.

The achievement of such a defense capability is uniquely important for the United States. Historically, our national policy has always been nonaggressive. We have never struck with military power until the enemy struck first. That is why we need an active anti-missile defense which would save many of our people, cities, industrial complexes and defense installations in the event the enemy should attempt to strike us down in a surprise missile attack.

Scope of Problem

THE Nike-Zeus development program is directed toward providing that important segment in our Nation's overall defense posture. Rejecting the concept of "ultimate weapons," the Army believes the Nike-Zeus system can be readied to bat down intercontinental ballistic missiles plunging toward targets at speeds ranging from 15,000 to 20,000 miles per hour.

The Commanding General of the North American Air Defense Command recently pointed out that the Nation's only weapon system now being specifically developed to provide such a defense is the Army's Nike-Zeus. The Army is confident that the 1961 tests planned in the South Pacific, during which Nike-Zeus missiles will be launched from Kwajalein Island against Atlas ICBMs fired from California, will demonstrate that Nike-Zeus will do the job for which it is so urgently needed.

The urgency is repeatedly stressed by the ever increasing space activities of the Soviets, which most aptly

demonstrate their capability to build, launch and accurately guide large rockets.

TO perform its vital defense mission, the Nike-Zeus system must be able to detect extremely small objects coming in from any direction at speeds approaching eight times the muzzle velocity of a bullet fired from an M1 rifle. It must be able to track multiple targets and isolate them from any decoy devices they may eject. Lastly, it must be able to control defending missiles to intercept the incoming warheads and render them completely ineffective.

At first look, the magnitude of the technical problems confronting such a defensive system seems enormous. The Army-industry team which is developing Nike-Zeus has found on closer examination that while technological advances are mandatory, nothing required for the Nike-Zeus system is beyond the state-of-the-art. Many problems that loomed as insurmountable obstacles only months ago have already been solved.

Development Team

RESPONSIBILITY within the Ordnance Corps for system management has been assigned to the Army Ordnance Missile Command (AOMC). Under technical supervision of the Army Rocket and Guided Missile Agency, an element of AOMC, the development team has focused the finest civilian and military scientific talent available in an across-the-board approach to all phases of the Zeus system.

All the Army technical services are working on the program and fourteen government laboratories are participating. A partial listing

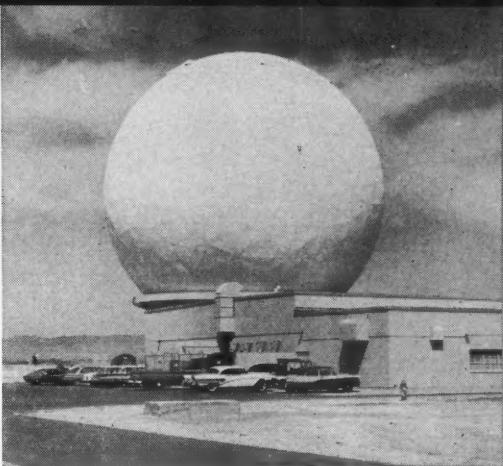
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Acquisition radar transmitter, left, sends out impulses that return from incoming warheads, are picked up by towering receiver, right, and magnified by Luneberg lens.

of major contractors reads like a *Who's Who* of American industry. A listing of all industrial contributors would fill this magazine. Western Electric Company, Inc., the manufacturing arm of American Telephone and Telegraph, is the prime contractor for the system, and Bell Telephone Laboratories, the research element of American Telephone and Telegraph Company, has overall research and design responsibility.

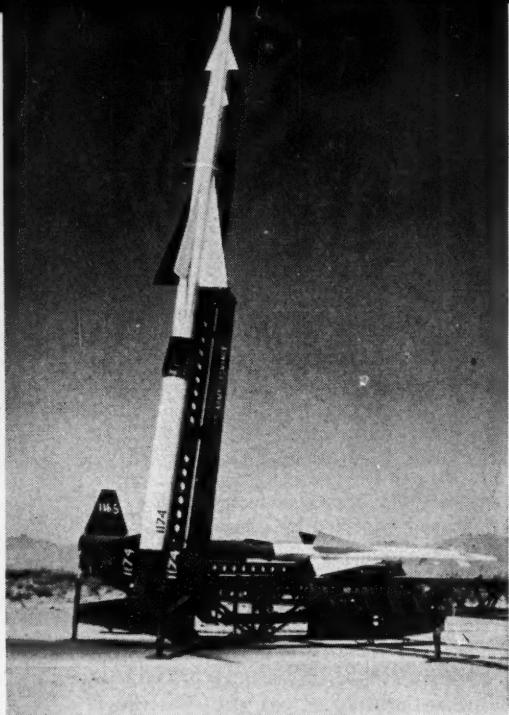
Principal sub-contractors include Allis-Chalmers Manufacturing Company; Armstrong Cork Company; Burns and Roe, Inc.; Continental Can Co., Inc.; Continental Electronics Manufacturing; Douglas Aircraft Co.; Dow Chemical Company; Goodyear Aircraft Corporation; Lear, Inc.; Narmco Manufacturing Company; Remington Rand Univac; Sperry Gyroscope; Steel Products Engineering; Stromberg-Carlson Company; Texas Instruments, Inc.; Thiokol Chemical Corporation and Vickers, Inc. Hundreds of other contributors, primarily small businesses, are active partners in the program. Every

component of the system, ranging from minute transistors to immense radar antennas, is being worked on simultaneously across the Nation.

Background of Experience

COORDINATING this effort and guiding Nike-Zeus development every step of the way, are military and civilian experts with 15 years experience in perfecting ground-to-air defensive systems. The Nike-Zeus family tree has roots in the closing days of World War II when Bell Telephone Labs developed the first large electronic fire control directors for the Army. This experience led to the possibility of creating a ground control system for guided missiles. It provided the building blocks for the Nation's first air defense guided missile system, Nike-Ajax, which by the early 1950's had proven a successful counter to the threat posed by trans-sonic, high altitude, piloted bombing aircraft.

As the enemy threat was expanded to indicate possible attacks by whole formations of high-performance supersonic bombers flying at



Experience gained by Army-industry team in producing this first generation Nike-Ajax later was projected forward to provide . . .

extremely high altitude, the same Army-industry development team projected forward to provide the Nike-Hercules system within a time frame to counter such a threat. The Hercules system is now guarding our defense and industrial installations and population centers.

The experience gained by this team in the exacting development of command-guided, high-speed missile systems represented a built-in advantage—a factor that made that team a natural choice to tackle the Nike-Zeus project. In fact, several studies on anti-missile missile possibilities had already been completed prior to formal establishment of the Project Nike-Zeus Guided Missile Defense System by Ordnance Technical Committee action in February 1957.

Development of the Zeus system as the third generation of the Nike family is following the same fundamental approach already proven so successful in Hercules and Ajax. The technical problems are more involved, but in concept it is the logical step forward from a very firmly established base. It employs the command guidance principle as did its forerunners, extending their capabilities by taking advantage of advances in the state-of-the-art.

Detecting the Target

DETECTION of incoming warheads will be accomplished with broad-beamed acquisition radar capable of scanning millions of cubic miles of space. Smaller and lower powered radars than the Zeus acquisition radar use the same antenna to transmit and receive. To achieve the extreme range capability required to detect, recognize and take the required action to stop something small while traveling with the speed of an ICBM warhead requires great power output. To accomplish this task, the Zeus system will employ individual antennas in the acquisition radar to transmit and to receive.

The transmitter consists of three arrays in a horizontal, triangular arrangement rotating 360 degrees in azimuth. Turning in synchronization with the transmitter, the receiver located nearby is a large Luneberg lens with multiple, independent receiver horns. The Luneberg lens functions much the same as a monster magnifying glass, focusing the radar pulses returning to the receiver from the incoming warhead hundreds of miles away.

Many radars in use today can provide information on single air-

liners in flight at ranges in excess of 100 miles, but that is a relatively simple problem compared to the one handled by Zeus. The Zeus radars will be able to track very much smaller targets at much greater distances. Once the target is located, needle-beamed target track radars will take over automatically, acquiring the quarry and furnishing continuous, precise information to computers that will determine the appropriate intercept point.

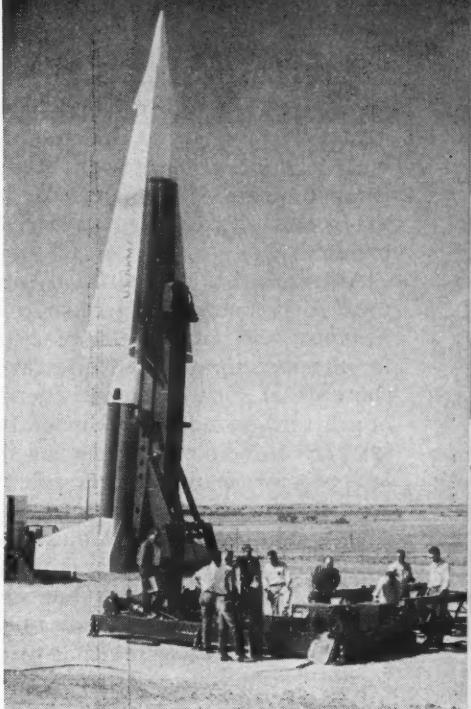
Discrimination radars are also provided which are designed to appraise the target with the gimlet eye of an electronic tax assessor, sorting out the deadly warhead from the decoys the enemy ICBM may eject and supplying data automatically by precise measurements to pick the real from the phony.

Making the Kill

AT the proper time the system fires the Zeus defense missile. Missile track radars will follow the defending Zeus missile as it streaks upward toward the enemy ICBM warhead. The computer continuously issues orders through command guidance to the missile, steering it along an invisible road that ends at the intercept point. At the most appropriate time, a burst order is sent to fire the Zeus nuclear warhead.

As planned, Nike-Zeus installations will be set up to operate independently, in support of one another or integrated into other systems that may be developed. Capabilities of other systems that could extend initial early warning time will be used if available.

All this sounds very simple. Keep in mind that the entire engagement from detection to kill will be



... the Nike-Hercules system (above). Development of Nike-Zeus as third generation followed much the same fundamental approach.

gin and end in a matter of minutes.

Previous defense systems have been able to supplement their missiles and black boxes with humans to make the logical decisions which direct the efficient utilization of the defense. Human intervention will be possible in Nike-Zeus operation, but not encouraged. The nature of the threat—ballistic missile warheads with speed and lethality that defy description—make mandatory a fully automatic response. The Zeus system is designed to operate "hands off" from detection to kill.

Research Applied

IN the three and one-half years of the research and development program, the Nike-Zeus system has moved ahead rapidly and on schedule. Equipment has been devel-

Nike-Zeus—Missile Killer

oped, fabricated, installed and made ready for testing. There have been significant technical breakthroughs in all major elements of the system—radars, computers and missiles.

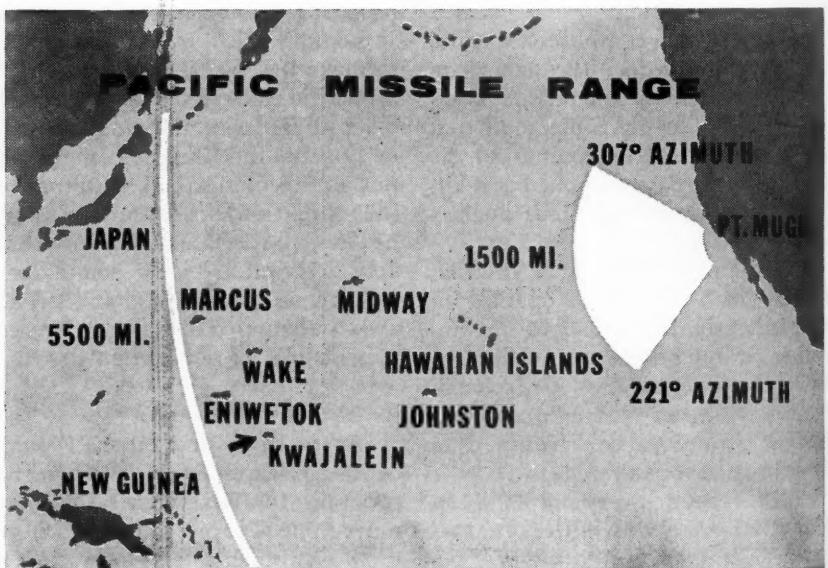
Antennas of the physical size used in the acquisition radar, for instance, will convert to practice for the first time the theories and concepts of focusing radar energy of great magnitudes. The magnifying glass principle of the Luneberg lens provides many multiple receiving beams capable of tracking many objects simultaneously. A means of amplifying microwave energy using solid state diodes as opposed to other concepts of vacuum tube or transistor amplification extends the capabilities of Zeus radars and other system components.

Immense transmitter power is re-

quired to detect small, swift ICBM warheads—comparative pin-pricks of matter in the black voids of space. Extremely high powered tubes, wave guides, rotary joints—all necessary equipment to enable the Zeus acquisition radar to radiate such power and beam it in a searchlight sweep—are now in being in the Army research and development program and are successfully undergoing test.

Transmitter power output of the Zeus system is such that safety precautions are built into the system to keep people away from the antenna output, lest they suffer bodily injury when it is in operation. Power of this magnitude, generated on the correct frequency, could boil an egg in a flash, broil a steak in seconds or char a roast of beef in a few more.

In forthcoming tests, Nike-Zeus on Kwajalein Island in Pacific Missile Range will be fired against an Atlas missile to be launched from distant Point Mugu, California.



Naturally, equipment that can do these things must be large. But in a command guidance system, all of the sizeable, complex elements are placed on the ground and have the advantage of being used again and again. They can be as large and as complex as the problem requires without hampering system performance. The acquisition radar transmitter is about the size of the Yankee Stadium infield. Its receiver is eight stories high. Forty-two box car loads of materiel is required for the Luneberg lens for each receiver.

Precision and Speed

ADVANCES in technique give the target track radar the ability to furnish extremely accurate data on tiny targets hundreds of miles away. Its mechanical components must be machined to closer tolerances than ever before so that the resulting accuracy will be compatible with that of the electronic components and fit into the overall system scheme.

The huge mount for the target track radar weighs in the tens of tons and is the most precise ever produced. The velocity of the approaching warhead, the need to handle a number simultaneously to avert a saturated defense, and the absolute ability to pick out real targets from the "junk" of fragmented boosters and decoys in the background—all make it mandatory that data gathering and processing devices used in the Zeus system be of "A" grade. There will be no time for second thoughts or revised answers.

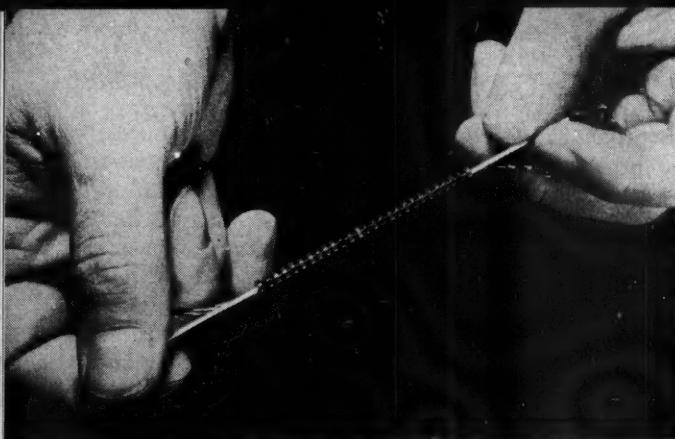
Specially designed for their part in the anti-ICBM role, the Zeus computers can be built more rapid-

ly than conventional computers and perform their "think" function quicker than their human counterparts. The electronic brains that perform so many business functions today have an add-and-subtract time of five to ten-millionths of a second. Zeus computers can handle their problem and be well on the way through the next one within the same time span.

The extremely rapid data handling required of the Zeus system has been achieved with minute, high-speed switching transistors, another recent technical breakthrough. A most recent significant technical development is a computer permanent memory device called a "twistor." Made of bar magnets and hair-thin wires wrapped with magnetic metal tape in barber pole fashion, this permanent memory device can supply the large quantities of required bits of information to the computer in millionths of a second as necessary to handle the Zeus problems. Only 14 months elapsed between the decision to use such devices and the time they were ready for production, again demonstrating the outstanding capability of the technical team devoted to Zeus.

Zeus computers will require precision, deposited-carbon resistors in quantity and quality far in excess of any previous requirements. The research and development program has required a sizeable number of these devices. Fully automatic production techniques have been in use whenever available for the production of these resistors. Human hands touch them for the first time when they are removed from their packages for installation.

Resistors of various sizes and



Tiny new "twistor" is permanent memory device to supply information to computer in millions of seconds.

transistors so tiny that a man can hold more than 100 in the palm of his hand will be required by the millions when the Zeus system goes into production. Recently funds were released to develop manufacturing techniques and equipment that will make possible volume production of such critical components when production of the Nike-Zeus system may be authorized.

Three-Stage Missile

THE bullet fired by the system, the Zeus missile, will have to travel at higher speeds and to higher altitudes under more exacting environmental conditions than any previous defense missile. Development progress of the three-stage, solid fuel Zeus has been rapid and significant. The early winged configuration of the missile was fired successfully several times in an initial program that began in August 1959. This included a successful firing from an early version of an underground launch cell planned for tactical use.

The test program has now advanced to the point that test firings of a tactical missile configuration are being conducted. Vanes jutting from its pointed head give it an

appearance, in silhouette, of a stiletto with ears sprouting from the blade. The first missile of this configuration was launched in August this year.

Since time is of the essence in the Zeus system, it is mandatory that the missile have very high performance. The booster motor is an indication of what is required. It is the largest single grain solid propellant motor ever fired in the Free World. The booster sends the Zeus arroing up and out of sight in about the time it took to read this paragraph.

Thermal protection techniques are required to shield the missile from the effects of its terrific velocity. These techniques have been successfully demonstrated in actual firings. Without such protection, the heat generated by the missile's passage through the atmosphere would turn the Zeus into a red-hot glob of molten metal.

A means of guiding the missile's third and final stage outside the earth's atmosphere has been worked out and will shortly be tested to demonstrate that it will give absolute control of the Zeus from launch to intercept, whether inside or outside the atmosphere.

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Test Progress

TO compress Nike-Zeus system development into the minimum feasible time, preparations are underway to accomplish simultaneous testing of various components. Facilities are being prepared at test sites spotted halfway around the earth. The Corps of Engineers is handling this trying construction assignment with its traditional "no-sweat" efficiency.

Zeus firings to date have been conducted at White Sands Missile Range, New Mexico, another element of the Army Ordnance Missile Command. An acquisition radar, missile track radar and target track radar have been emplaced. Testing of radar development, some of the missile and guidance units, and a portion of other components of the system will be conducted there. Testing of the acquisition radar is underway and has proven highly satisfactory to date.

Far down the Atlantic Missile Range, a Zeus Target-Track Radar is being installed on Ascension Island in the South Atlantic, midway between South America and Africa. Targets of opportunity—ICBMs launched from Cape Canaveral—will be tracked to test radar performance and to obtain data on actual ICBM characteristics which will further assist in refining details of the ICBM threat. Some data applicable to Zeus target discrimination will also be collected at Ascension Island.

As the extensive range and altitude capabilities of the Zeus prohibit complete system testing at White Sands, test of the complete missile and its guidance and control system will be conducted from facilities at Point Mugu, Califor-

nia, on the Pacific Missile Range.

Finally, tests will move literally from today into tomorrow—across the International Date Line to the Marshall Islands in the Southwest Pacific. A complete Zeus system is being installed on Kwajalein Island. In a showdown series of firings, Zeus missiles will be launched and controlled from Kwajalein to intercept the re-entry bodies of Atlas ICBMs fired west from Vandenberg Air Force Base, California.

AS Nike-Zeus research and development continues, the abilities and experience of the many agencies concerned with its employment, operation, site construction, training, supply and maintenance are laying the groundwork to field the system in minimum time. The U. S. Continental Army Command, Army Air Defense Command, Air Defense Board, Air Defense School, Ordnance Guided Missile School, the Signal Corps, the Corps of Engineers and many other Army agencies are helping to prepare deployment plans in anticipation of a production go-ahead.

The Army is sure that the Zeus system will continue to demonstrate its successful development and feels it is now ready to be ordered into production.

An operational Nike-Zeus defense of the United States means that the aggressor will not be able to salvo his missiles with confidence that his first punch will be a straight right to our chin.

Nike-Zeus could save millions of lives, many industrial complexes and cities and provide the *difference* between who "wins" and who "loses" a nuclear war—a war in which only the "winner" survives.

**Wherever the Army
is stationed—**

Safety ²⁰ Also Serves \$



Thomas H. Wilkenson

THE U. S. Army has always been concerned with safety of its personnel. In fact, one of the first Army "safety regulations" on record is the order issued from General George Washington's headquarters at Valley Forge to the effect that there would be "no open fires in buildings where gunpowder is manufactured."

As Army operations became more complex and as high-risk activities increased, the requirement for safety standards, policy and procedural guidance also increased. During World War I, the Chief of

Ordnance published "Safety Operating Rules for Plants Manufacturing, Loading, Handling, or Storing Powder, Explosives and Loaded Shell." This was the precursor of the present-day *Ordnance Safety Manual*, a document widely used in private industry as well as in Government.

In 1933, the Chief of Engineers, concerned with losses due to injuries among civilians in construction activities, initiated a program to reduce accidents.

Early in World War II, The Provost Marshal General was assigned responsibility for plant protection and security. When it became evi-

**THOMAS H. WILKENSON is U. S. Army
Director of Safety.**

dent that losses resulting from personal injuries and damage to equipment far exceeded those resulting from sabotage, The Provost Marshal General was directed to organize and direct an accident prevention program for employees working in firms having Government contracts.

Effectiveness of this program, supplemented by those of the Advisory Board on Fire and Accident Prevention and the War Department Safety Council, led to the extension of accident prevention activity to military personnel. Army motor vehicle operation was the first area to be covered.

The program steadily increased in scope until in 1946 the Army Safety Program was broadened to include all Army operations and activities, both military and civilian on a world-wide basis, and became properly identified with personnel management.

Accidental Loss

THE impact which accidental loss can have on Army operations is readily apparent in statistics. During the period 1942-1945, for example, there were about two million hospital admissions of Army personnel for non-battle, non-fatal disabling injuries, and approximately 60,000 non-battle deaths. This averaged out to some one-half million injuries and 15,000 deaths each year caused by accidents. During this same period, there were 68 battle injuries and wounds in contrast to 113 non-battle injuries per 1,000 oversea personnel strength.

During the Korean War, the above trend was reversed. From July 1950 through December 1952,

there were 147 battle injuries and wounds as compared to 138 non-battle injuries per 1,000 oversea personnel strength.

Last year, Army manpower losses due to fatal and nonfatal disabling injuries were equal to the loss of a battle group for the entire year, and the outlay resulting from accidents would have been more than enough to feed every man in the Army for the year. Last year, Army accidents cost an estimated \$357 million—\$89,325,000 in direct cost, plus an indirect cost of \$267,972,000 based on a three-to-one ratio.

Extent of Program

IN SCOPE, the Army accident prevention effort extends to every operation and activity, and every level of command world-wide, wherever military personnel are stationed and wherever civilians are employed. During 1959, the program covered approximately 870,000 active Army military personnel, 370,000 Army U. S. civilian employees, 155,000 foreign nationals, and 260,000 other personnel. The latter included contractor employees on Army projects, personnel paid from non-appropriated funds, and civilian component members training on Army installations. In magnitude, the Army Safety Program thus comprises the largest single organizational safety effort in existence.

In value received, the monies expended for accident prevention represent the best support dollar spent by the Army. Besides keeping accidental manpower and monetary losses to a minimum, the program provides more efficient utilization of resources and advances the combat effectiveness of the Army.



Secretary of Army Brucker and Army Safety Director Thomas H. Wilkenson get sixth consecutive Award of Honor from Howard Pyle, President of National Safety Council.

Administration

IN THE Department of the Army, safety management is a function of the Director of Military Personnel Management, in the Office of the Deputy Chief of Staff for Personnel. The Deputy Chief of Staff for Personnel is responsible for overall staff supervision of all Army safety activities, and coordination with Army staff agencies and field commands on matters pertaining to safety management. The Director of Safety, on the staff of the Deputy Chief of Staff for Personnel, is responsible for planning, organizing, directing, and controlling of a comprehensive, aggressive, and continuous accident prevention effort throughout the Army.

Implementation is delegated to commanders at every echelon, who establish safe practices and procedures. In areas such as aviation, traffic, fire explosives, and missiles, the efforts of the commander are

supplemented by specialists. Technical control and guidance are provided, under Department of the Army direction, by the heads of the technical staff.

Within the major commands and services, the commanders-in-chief, the commanding generals, and the heads of the technical staff are responsible for the direction of adequate safety programs. Within an individual command or service, the Safety Director is the principal safety staff adviser and is responsible for monitoring and developing an effective safety program.

The Safety Director—who may be either military or civilian—acts in an advisory capacity to the commander. He provides information, counsels, suggests procedures, develops techniques and assists in carrying out certain functions. Responsibility for actual accomplishment, however, rests with the commander and his staff.

Responsibility for accident prevention moves from Department of the Army level, through command, to the lowest echelon. Every military and civilian supervisor has a stake in this responsibility. In the last analysis, however, it is the performance of the individual soldier and civilian which determines the effectiveness of the program.

Training

SAFETY is integrated into Army training programs in such a way as to become a natural part of the training of military and civilian personnel. Every Field Manual is in effect a safety manual. Other media advancing safety training include lectures, demonstrations, films, and graphic training aids. Recently an orientation program, "Safety and Command," has been developed for use by units.

Military and civilian safety personnel may increase their knowledge of accident prevention doctrine and its application through attendance at Army Service Schools and at external facilities. Among courses available through Army Service Schools are those dealing with Radiological Safety and Guided Missile and Special Weapons Safety.

Training at external facilities includes aviation safety training at the University of Southern California, motor vehicle and traffic safety at Northwestern University, and safety program organization, administration and management at New York University.

Safety training also is conducted by supervisory personnel at all levels. Various packaged programs of instruction are provided, along with visual aids, handouts printed

in foreign languages overseas as well as in English. The various programs cover supervisory techniques, and accident reporting procedure.

Promotional Activities

IN ORDER to generate and maintain interest in accident prevention, the program uses a wide variety of methods, ranging from the safety poster to involved research into the reasons why people commit unsafe acts. Between these extremes, there are handout materials, radio and TV spot announcements, special emphasis campaigns, safety contests, displays and exhibits.

Through sample surveys of military personnel, the effectiveness of different types of promotional media and preferences for certain types of promotional material are evaluated. Since the majority of accidents arise out of human failure, increased attention is being given to the role of the human element. Substantial effort is being directed toward an investigation into why people resist efforts designed for their well-being.

The Army supports various national campaigns designed to create safety awareness on the part of the general public, including the Slow Down and Live Campaign, Back the Attack on Traffic Accidents, Vehicle Safety Check for Communities, Fire Prevention Week, and Job Safety Week.

Engineering

SAFETY engineering is concerned with the elimination or control of hazardous conditions. It seeks to provide optimal performance of equipment and operations, making it difficult for a person to

Safety Also Serves

become involved in an accident or to involve others. Army construction plans are regularly reviewed for safety implications. The Ordnance Corps *Safety Manual*, for example, requires that the Safety Director shall arrange for prior review of process plans, drawings of new construction, facility modifications, equipment specifications.

Safeguards are built into equipment to insure maximum safety while still providing optimal performance. By way of follow-up, reports of unsatisfactory equipment and accidents are studied to determine whether any engineering action may be indicated.

Codes and Standards

SAFETY criteria have been established for equipment, procedures, and practices in the many areas of activity in which the Army is engaged. The responsibility for developing and publishing these criteria is assigned to the Deputy Chief of Staff for Logistics. Where a satisfactory level of safety cannot be assured through the design of equipment or structures alone, safe working conditions are strengthened through the use of personal protective equipment. Where specific guidance is not provided by Army directive, codes and standards established by such agencies as the American Standards Association, National Bureau of Standards, Interstate Commerce Commission, and the National Board of Fire Underwriters are used.

Unsatisfactory Equipment Reports call attention to equipment failures, and investigation is undertaken to determine whether redesign of the standards criteria is appropriate and desirable.

Accident Reporting

UNIFORM procedures and requirements have been established for the investigation, reporting, and analysis of accidents. Information thus obtained is used by commanders for corrective action.

Where accidents result in first aid or in minor property damage, the report remains at the installation or activity level. Reports of accidents which result in death, disability or extensive property damage are forwarded to the appropriate major command or technical service for action and for planning purposes. As a general policy, accident reports go only to that level of command where corrective action may be initiated.

National Awards

THE Army's achievements in controlling accidental loss have gained national recognition. The Army is the only Federal agency in the over-50,000 employee category to have earned the President's Safety Award, the highest safety citation in Government, a second time. It has earned the National Safety Council's highest award, the Award of Honor, fifteen times in the past seventeen years.

Another type of recognition takes the form of inquiries from other Federal agencies and from foreign governments requesting information on accident prevention techniques which have been employed so effectively by the Army. To peoples abroad, the program gives visible evidence of the value which the United States Government places on the individual.

The challenge facing the Army Safety Program is to improve upon

an already commendable accident prevention effort. As weapons systems increase in complexity, a proportionate amount of time and funds will be needed for research into the human factors associated with error-free performance and into the various types of mechan-

cal and operational safeguards.

With this effort backed by its dedicated personnel and a tradition of solving the most difficult problems, the Army is determined to meet the hazard-filled challenge of the future with characteristic vigor and distinction.

Relaying 68,000 words per minute—

Courier Satellite Widens Communications Horizon

VIEWED as a practical forerunner of global communications of the future, the U. S. Army's Courier satellite is now orbiting the earth every two hours, communicating regularly with two stations, one at Fort Monmouth, the other in Puerto Rico.

The 500-pound, 51-inch successor to the Score satellite that carried the famed Christmas message of President Eisenhower in 1958 can simultaneously receive and send about 68,000 words a minute. It is regarded as the forerunner of a series of communications satellites that could revolutionize world-wide communications. Several such satellites could relieve congested radio channels since it uses ultra-high range frequencies, a relatively unused part of the radio spectrum.

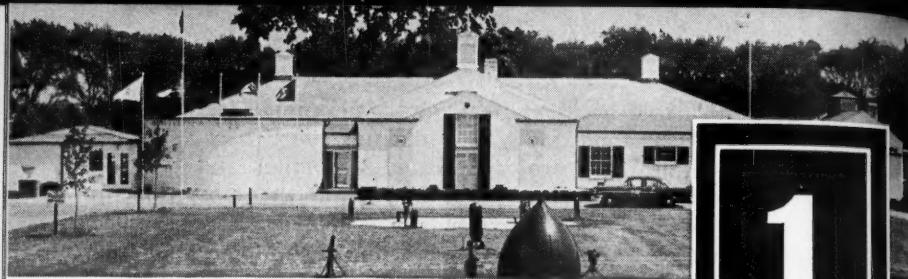
Courier was transferred to the Army in September 1960 by the Defense Department's Advanced Research Projects Agency, and was launched successfully by an Air Force Thor-Able-Star. It was developed under technical direction of the Army Signal Corps at the Signal Research and Development Laboratory, Fort Monmouth, New Jersey.

Its electronic equipment, weighing 300 pounds, is powered by 19,200 solar cells which convert sunlight to elec-

tricity. Unlike the Echo satellite which returns messages by reflection from its aluminized skin, Courier receives messages, stores them on tape, and then transmits them back on receipt of a coded command. As Courier approaches a ground station, it is detected by a specially built 28-foot dish-shaped antenna which automatically locks on and tracks the satellite until it is out of range.

Payload of the Courier satellite was built by Philco Corporation of Philadelphia; tracking antennas were designed by Radiation Inc., of Melbourne, Florida; and ground receiving equipment was built by International Telephone and Telegraph Laboratories of Nutley, New Jersey.

ANOTHER communications satellite, known as Project Advent, also has been turned over to the Army to be developed by the Army Signal Corps. Objective of this experiment is to conduct the research and development necessary to demonstrate feasibility of a satellite operating in an equatorial orbit at a height of some 22,000 miles. Brigadier General William M. Thames, Jr. has been named Commanding General of the Project Advent Management Agency.



**At the Cantigny War Memorial Museum,
changing dioramas of sight and sound
bring alive the Big Red One's unique**

Archive of Courage

Captain Henry J. Kelty, U. S. Army (Ret.)

MILITARY ceremonies in August marked the dedication of the \$900,000 Cantigny War Memorial Museum of the First Division, now open to the public on the estate of the late Robert R. McCormick, editor and publisher of the *Chicago Tribune*, near Wheaton, Illinois.

Headed by Lt. Gen. Clarence R. Huebner, USA, Retired, its World War II division commander, the Society of the First Division, representing 45,000 members and former members of the famed Big Red One, along with the board of trustees of the Robert R. McCormick Charitable Trust, and officials of the Department of Army attended the unveiling by George H. Roderick, Assistant Secretary of the Army. The museum was established and built by the McCormick

**CAPTAIN HENRY J. KELTY, U. S. Army,
Retired, served 20 years with the 18th Infantry Regiment, 1st Infantry Division, before assuming duties as Curator of the Cantigny War Memorial Museum of the First Infantry Division, Wheaton, Illinois.**

Charitable Trust in recognition of the publisher's lifelong interest in the unit with which he served in World War I.

Situated on the 485-acre Cantigny estate, the unique military museum is dedicated to the courage and valor of all United States soldiers. It commemorates the battle of Cantigny, France, the first World War I action in which American troops fought as a unit. At the time, Col. McCormick was commanding the First Battalion of the Fifth Field Artillery Regiment of the 1st Infantry Division.

The museum utilizes modern techniques of exhibit design and construction to present dramatic and authentic details of the history of the Division. Animated displays and dioramas project a capsule history of the Division in two World Wars.

Central theme is established by a flaming reproduction of the Big Red "1," the Division insignia, inlaid on the museum floor. This is

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surrounded by a revolving frieze of eight full-color transparencies of historic American battle paintings in which units of the Division took part from Revolutionary War days. (See "The Big Red One," November 1960 DIGEST.)

Beyond the entrance exhibit are photographs of all 39 officers who have commanded the Division from 1917 until today. Overhead are the historic guidons of the Fifth Field Artillery dating back to Alexander Hamilton.

In the north section of the main exhibit hall is concentrated the World War I history of the Division. Included are a full-scale dugout and trench, an animated map tracing movements of the organization, and a diorama showing the battle of Cantigny on 28 May 1918.

At the push of a button, the sky over the village of Cantigny lights up, revealing troops ready for the dawn attack. Batteries of stroboscopic lights flash a realistic re-enactment of artillery, machine gun and small arms fire. The troops attack, the village crumbles, while battle sounds synchronize with the flashing gunfire. Earphones provide viewers with a running account of the battle as it unfolds on the changing diorama screens.

HISTORIC World War II activities are concentrated in the

south section of the hall. Beginning in a fiber glass tunnel, visitors see the training and build-up in England, the invasion of North Africa, the Sicily campaign. Emerging from the tunnel, visitors see a reproduction of a German bunker containing captured German souvenirs. An animated map of World War II traces the division through its eight major campaigns. Another diorama shows the Division's D-Day landing on Omaha Beach.

Memorial Hall

ADJOINING the main exhibit area is a marble and wood-panelled Memorial Hall dominated by a half-sized replica of the Omaha Beach shrine erected as a tribute to all who took part in that operation. Names, photographs and citations of the 31 Medal of Honor winners of the Division in all wars are displayed, along with medals and other awards bestowed on Col. McCormick during his life.

An Archives Building, located in one wing, contains a library of materials available to serious students of military history. The library also maintains a film service for audiences desiring military films for group showings.

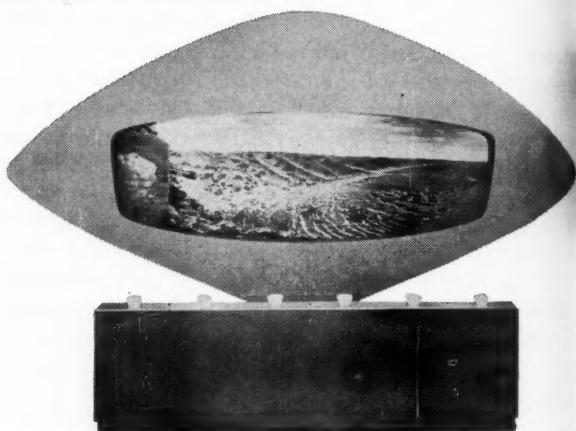
The museum is located amid attractively landscaped gardens. Displayed on the mall are tanks, artillery and weapons of both wars.

Replica of Division's insignia inlaid in floor, surrounded by battle scenes, stands in museum entrance hall.





Half-size replica of shrine at Omaha Beach serves as tribute to servicemen who took part in the invasion.



Animated diorama tells story of D-day landing to provide "living experience" for visitors going through exhibits.

IN 1918, when Americans first entered combat in World War I, our Allies lay almost prostrate from four years of exhausting war. The flower of youth had been destroyed—their will to fight was undergoing a final desperate assault by the enemy. In this hour of crisis, the American First Infantry Division engaged in the first separate American military action of the war in the battle at Cantigny.

"The victory won by the First Division in its first combat action literally lifted

the hearts and hopes of our Allies. General Pershing, Commander of the AEF, said in a speech following the Armistice that "The success which attended the attack (at Cantigny) not only set an example for future American Divisions to follow but really had an electrifying effect through the Allied lines and gave new hope to the Armies." To our Allies you were not just the First Division; you represented the American Army and the American Army had won a victory which turned the tide.

"Once again in World War II, you of the First Division brought hope to the



Divisional records are included in library of military history, above, while at right the structure of an infantry division is shown. World War I activities are displayed in rotating spiral in foreground.



people of Europe when you led the invasion of North Africa in 1942. Again when you helped to spearhead the liberation of the conquered peoples of Europe with your invasion of Omaha Beach in Normandy on 6 June 1944, you further symbolized the American Army as the liberator of oppressed peoples from tyrannical rule. On these and many other occasions, the men of the First Division symbolized, impressively, the American soldier. Thus, your actions reflected great credit upon the United States Army as a whole.

"... The Trustees of the Cantigny

First Division Foundation would wish this museum considered as a tribute not only to the First Infantry Division but to the United States Army as a whole. In that sense, and for the American people, I accept this museum as a fitting and appropriate means of perpetuating the valued traditions of the U. S. Army, and as a memorial to the bravery of all U. S. fighting men of all Services."

*The Honorable George H. Roderick,
Assistant Secretary of the Army (FM),
at Cantigny War Memorial Museum,
Wheaton, Illinois, 20 August 1960.*

It will be farewell to squat jumps and push-ups when the Army implements its new

Physical Combat

Colonel James E. Reilly, USA-Ret.

KEEPING pace with rapid changes in organization, weapons and concepts of modern war, the Army is moving to adopt a new physical proficiency test that will continually measure the fitness of its fighting men for immediate combat and all that it demands. A new Physical Combat Proficiency Test has been approved by the Army, and upon implementation it will become standard.

The test will be administered once at the beginning and once before the end of basic combat training to all male Army members 40 years old or less. Other tests will be given as a command prerogative. Men over 40 may take the test if they wish.

The new test will replace the Physical Fitness Test adopted in 1954, which was not considered combat-related since it consisted of

COLONEL JAMES E. REILLY, USA-Ret., was until recently Information Officer at Headquarters, U. S. Army Infantry Center.

push-ups, pull-ups, squat jumps, sit-ups and a speed-distance run. Actually only the running event had any relation to physical activity that the soldier would most likely be called on to exert in the field. Further, some events such as squat jumps and push-ups were monotonously repetitive.

Recognizing the need for a new test which would allow the commander more accurately to determine the fitness of his men for actual combat conditions, a project was begun in July 1958 by the Ranger Department of the Infantry School to evolve such a test.

A host of possibilities was explored including running, leaping, climbing, crawling, creeping, vaulting, jumping, marching, swimming and throwing. After studying tests of other Services and several foreign armies, including the British and Russian, and after considering such factors as the universal availability of facilities and equipment,



Proficiency test

to measure troop readiness for combat

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Scores in the 40-yard crawl—here being performed during test phase at Fort Gordon, Georgia—are measured by a combination of distance plus elapsed time.

uniformity of conditions and the time that could be devoted to such a test, five events were selected. These would measure ability in crawling, climbing, jumping, throwing and running.

Standards Applied

NEXT considerable thought and study was given to devising the specific tests and determining methods and facilities for administering them. It was decided that there should be a distinct relationship between test events and combat—that scores would be obtained by measurements in terms of time or distance or a combination of both, with the element of human judgment reduced to a minimum. Repetitious or monotonous events, such as push-ups and squat jumps, would be eliminated. Facilities, construction costs, and personnel needed to administer the tests, would be held to a minimum.

Above all, uniformity of facilities and area requirements was sought for comparative purposes since tests

would have to be run under similar conditions regardless of location.

Based on these criteria, the Physical Combat Proficiency Test as proposed by the Ranger Department consisted of the—

- 40-yard low crawl
- horizontal ladder
- dodge run and jump
- grenade throw
- one-mile run.

Testing the Test

FIRST checks on the new test were made at Fort Benning from January through April 1959, under supervision of James S. Dawson, civilian physical education specialist of the Ranger Department, who prepared necessary directives and manuals. Mr. Dawson was aided by Lt. Col. George R. Stevens III, Dr. Preston S. Abbott and Mrs. Doris A. Follettie, all of Fort Benning's Human Research Unit.

The tests then were administered to almost ten thousand troops at eight other Army installations—Forts Bragg, Carson, Gordon, Jack-

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son, Riley, Rucker, Stewart and Leonard Wood. From results and comments received, the Ranger Department determined that the new test was a valid and practical measure of combat proficiency.

The Infantry School then recommended to USCONARC that the new Physical Combat Proficiency Test be adopted for the United States Army. After further study by USCONARC, adoption of the new test was recommended as the standard measure of physical fitness for male Army personnel.

At the same time, it was recommended to eliminate the existing Physical Achievement Test from testing procedures.*

*The new Physical Combat Proficiency Test will replace both the old Physical Achievement Test and the Physical Fitness Test.

The objective of the Physical Achievement Test was to determine the soldier's physical ability to perform certain combat type skills. It consisted of: 5-second rope climb, 75-yard dash, triple broad jump, 150-yard man carry, and 1-mile run.

The Physical Fitness Test was used to determine the quality and degree of each soldier's strength and endurance. It consisted of pullups, squat jumps, pushups, situps, and a 300-yard run. A revised form of the "old" Physical Fitness Test will be retained for special purposes, such as acceptability for Airborne training.

Based on a compilation of field scores in the new Physical Combat Proficiency Test, a minimum acceptable standard has been set. To be rated as "physically fit," a score of 300 or higher is required.

Five Events

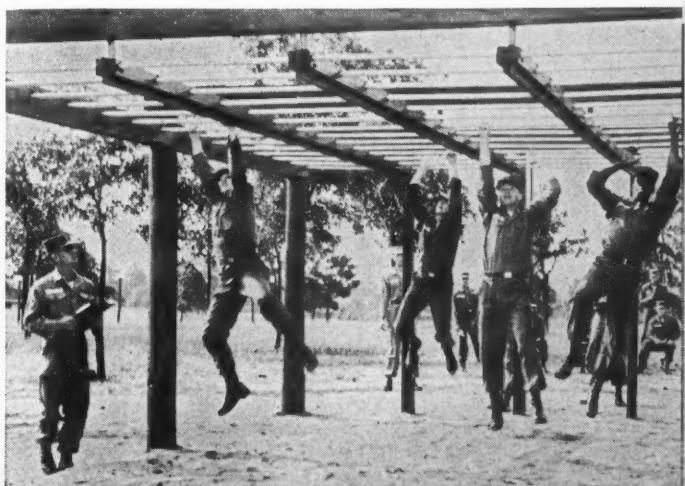
EACH event in the five-part test measures the physical capability of different parts of the body:

The 40-yard low crawl is a measure of individual endurance designed to test the ability to crawl. Examinees crawl 20 yards to the end line, turn on stomachs and return, always using only elbows, knees and feet. Scores are measured by a combination of distance and time.

The horizontal ladder measures general body coordination and shoulder girdle muscular development. Examinees move forward by alternating hands on successive rungs, go to the end of the ladder and turn back, making as many round trips as possible in one minute.

The dodge run and jump measures ability to jump and change direction rapidly. Examinees follow directional arrows around obstacles, jump a six-foot ditch and return. Two circuits are required. The en-

Horizontal ladder test measures body coordination and shoulder girdle muscular development of the soldier.





In the dodge run and jump, men follow directional arrows around obstacles, leap a six-foot ditch, return to starting point.

tire course totals 58 yards and is not considered an endurance test. Scores are computed on a distance-against-time basis.

The grenade throw tests ability to throw accurately and for distance. Examinees throw two practice grenades, then five for record. They begin in a prone position, rise to a kneel, throw and return to the prone position, aiming for the center of a target 90 feet away. Any arm movement is allowed.

The one-mile run is a measure of leg and wind endurance and the ability to make a prolonged run. To insure uniformity, a one-quarter mile track can easily be laid out.

Improved Procedures

STUDIES of the test show several conspicuous advantages over the existing Physical Fitness Test events:

► The battery is reliable; administration under varying conditions of weather and temperature resulted in uniformly consistent performances.

► Body height and weight have no appreciable consistent effect on performances.

► All ranges of performance can readily be measured; consequently those in poor physical condition can readily be identified.

► A large group of examinees can be broken down into equal numbers, and each group can then be alternated in order to keep to a minimum the time required to administer the test. About two hours is required for 100 men, or three hours for 200 men.

Test Procedures

A MINIMUM of 20 personnel is required to administer the test. This includes a chief examiner, an assistant, event supervisor and scorers. Equipment is kept to a minimum—two stop watches, prac-



Mile run on easily prepared quarter-mile track measures leg and wind endurance and ability to make prolonged run.

vice hand M-30 grenades, a signal flag, and sufficient identification numbers for the group being tested.

Each examinee is issued a pencil and a card. Supervisors are provided with manuals and scorers with clipboards and pencils. The supervisors read instructions to each group, call for questions, then stage a demonstration of the event—except, of course, the mile run. The examinees print their name and date, unit, branch, rank, MOS, age, height, weight and physical profile on the proficiency test data card. Scores are filled in by scorers at each test station.

Judging from the preliminary tests, tremendous troop enthusiasm has been generated for the new events. Major factors that won praise were its competitive aspects, stimulation of unit esprit, almost complete lack of monotony and repetition, low cost of facilities, and the singular absence of injuries. Only four minor injuries were reported in almost 10,000 tests.

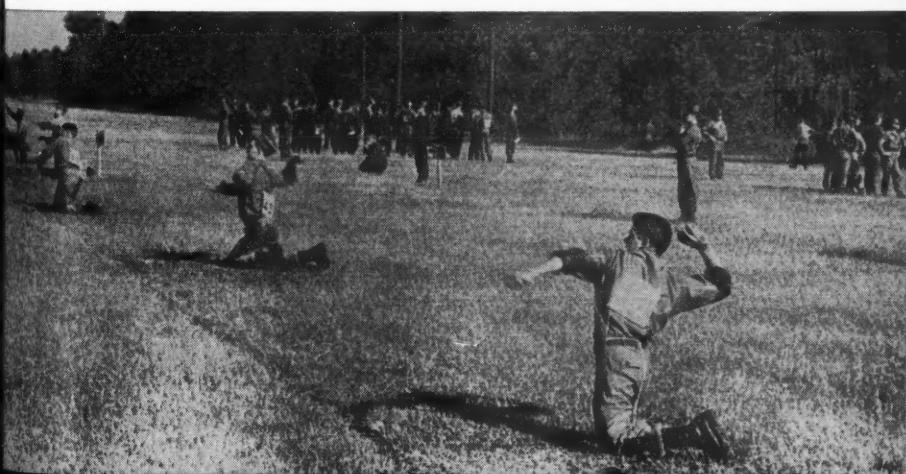
The competitive aspects of the new test events have morale build-

ing value. Already, posts that have taken the preliminary tests are watching closely as results are compiled, and various installations are establishing records for one event or another.

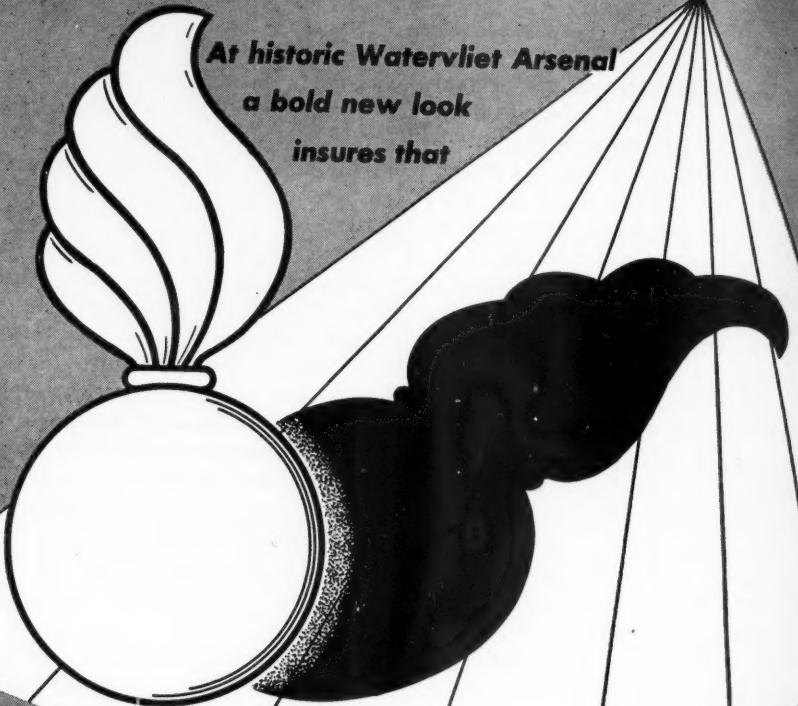
Besides injecting an element of intramural competition, the new Physical Combat Proficiency Test brings added realism to what was heretofore a repetitious testing task. Just as the modern Army through use of the Trainfire technique has made rifle marksmanship training a realistic test of skill, so physical fitness testing is now increasingly battle-oriented. Not only the individual soldier, but ultimately the Army and the Nation, are the winners.

Since combat can start with little warning in today's troubled world, the new tests will allow commanders to know the state of readiness of their troops, what progress is being made toward combat physical fitness, and what further training must be carried out to insure that troops are fit to meet the rigors of modern warfare.

Grenade throw tests ability to throw accurately and for distance, with men aiming at center of target 90 feet away, using any arm movement that they desire.



*At historic Watervliet Arsenal
a bold new look
insures that*



IT'S ALWAYS TOMORROW

Colonel Walter M. D. Tisdale

WITH one eye on the necessity for maintaining and improving the tried and true weapons of war that will always be necessary to an armed force, the 147-year-old Watervliet Arsenal on the Hudson River above Albany, New York, is turning the other eye for a search-

COLONEL WALTER M. D. TISDALE, Ordnance Corps, is Commanding Officer, Watervliet Arsenal, New York.

ing new look at tomorrow's exciting developments in research and engineering.

This bold and searching new look means that, in common with the Army as a whole, the Arsenal is concentrating more time, skill and talent on pure, basic research—the bedrock on which designers must build and the proving ground for hypotheses that one day will be

transformed into Army hardware. While this new look is quite obviously important, it is not immediately apparent to a visitor at the historic "Army Gun Factory"—as this installation was first designated when it was established in 1813 as "the principal establishment for the manufacture of ammunition . . . and equipment for artillery." The red-brick buildings have not changed much over the years, and scientists working in those buildings, examining a logarithmic graph or meditating on the fissures of a minute metal fragment, gave little outward sign of the spectacular results that may crown their efforts.

Here, where Watervliet's knowledge and skill produced the world's first 16-inch coastal cannon, the famed "Long Tom" of World War II, and the fantastic 280mm atomic cannon, research projects range from such exhilarating activities as changing temperatures at a rate of a thousand degrees a second, or magnifying chrome surfaces ten thousand times, or operating a pile-driving device that simulates firing a 90mm gun, to investigations of such phenomena as electrodepositions, elastic-plastic analyses, critical buckling torques in spheres, X-ray defraction studies, and some others that can only be described by higher mathematics.

Pilot-line Role

ONE phase of the new look that is readily apparent is the work on the Nike-Hercules guided missile. In the south end of the quarter-mile of towering red brick that the Arsenal calls the "Big Gun Shop," massive turning lathes and giant precision grinders have been sup-

planted by exotic equipment that shears, presses, welds and otherwise shapes the motors that will propel the Nation's primary air defense weapon. This is the Army's pilot-line for solid propellant missile motors.

In that phrase "pilot-line" is epitomized the reason for maintaining the arsenal system in a modern army. For while the motors and missiles as well as tanks, guns and other items of hardware, may be produced by the Army's partner, American industrial might, yet the planning must be accomplished and pilot models produced in the arsenals.

And while these arsenals, as typified by Watervliet, must constantly prepare for the future, at the same time much of their facilities must remain dedicated to design, development, procurement and pilot-line production of conventional weapons. In this realm, Watervliet's role happens to be heavy conventional weapons, a responsibility borne and executed since 1887 when Congress designated the arsenal as the "Army Gun Factory."

Accordingly, while Watervliet has enthusiastically embarked on the Hercules program, as well as performing design and engineering assignments for Honest John, Larcrosse and Hawk, it continues to concentrate on bringing from concept to combat readiness the tank-guns, towed artillery, recoilless rifles, mortars and the other so-called conventional weapons so essential to the Nation's defense today and tomorrow.

Developing Heavy Weapons

IMPORTANCE of improved conventional weapons, which may

not be readily apparent to laymen in this missile age, is constantly being stressed by professional military men. As Lieutenant General Arthur G. Trudeau, Chief of Research and Development, has put it: "Because the Army faces a dual threat—an atomic and a conventional threat—a design of defense which ignores the requirements for conventional forces means the throwing away of the two-edged sword demanded by today's challenge."

Based on its years of work with heavy weapons which has produced a unique reservoir of weapons knowledge, the skills and brains of the Arsenal today are zeroed in on far horizons. Knowledge of the old is being used to project these skills and brains in the production of what will become the conventional weapons of the future.

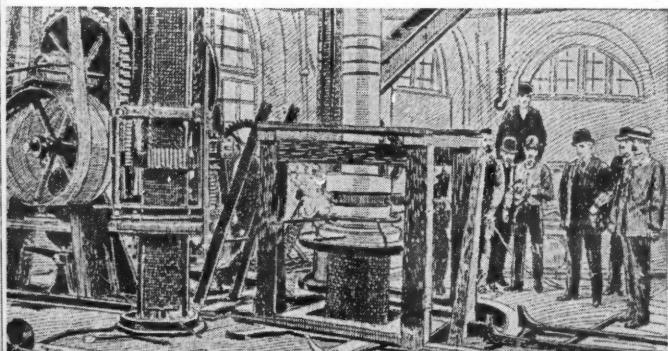
The designs, figures and symbols on Arsenal drawing boards today will become the harder-hitting, lighter, tougher weapons that will arm the American soldier a decade hence. An example is the recent production of the Davy Crockett, the lightweight mortar-like weapon designed to arm the Infantry with portable atomic firepower.

At the same time, the Arsenal is concentrating on weapons that cannot be termed conventional. Proving ground for this phase of

the work is the Research Branch of the Arsenal's Research and Engineering Division which was reorganized and beefed-up about a year ago. Here a hard core of "old pro" ordnance experts combine the invaluable knowledge and craft of experience with talents of scientific specialists imported from industry and educational institutions. Many of them—holders of Ph.D. and masters' degrees in metallurgy, mechanics, physics, chemistry—have joined the team building for the future.

Captain of this team is Lieutenant Colonel H. V. Mackey, Chief of the Research and Engineering Division. He points out that the Arsenal's increased activities in basic research constitute not a complete switch but rather an expansion of activities. Research has always been carried out, he notes, but it was limited to cannon manufacture. Today some of the work in materials analysis has application in many other weapons fields and of course to science in general.

While some current projects now underway may seem far removed from the immediacy of designing a new cannon, their ultimate results doubtless will prove fruitful and far-reaching. Often, the solution to a basic research problem today may answer a question faced by a designer tomorrow.



Shrinking jacket on an 8-inch gun 70 years ago contrasts with work in pure science now being done at the Arsenal.

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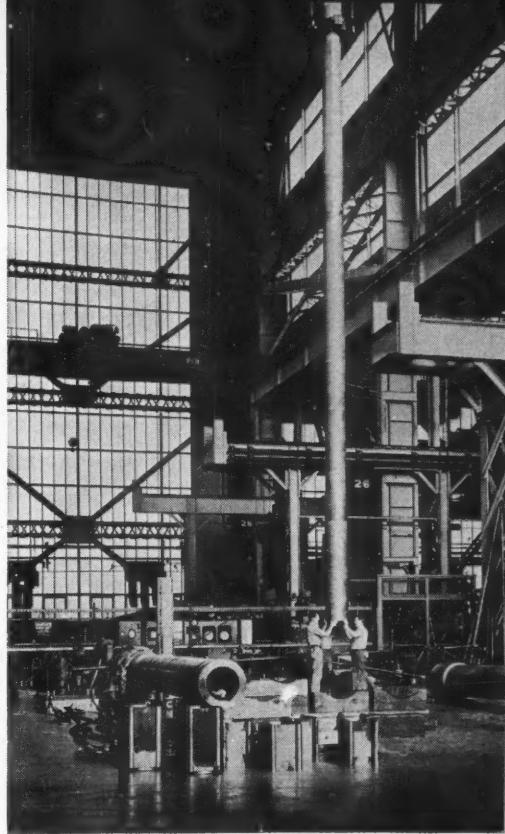
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One such project, assigned to the Arsenal by the Office of Ordnance Research in Durham, North Carolina, is to seek "the determination of thermal stresses in a spherical shell due to uneven heating of the surface." While this may sound like a purely scientific project, the solution may well prove vital to construction of a space satellite which will someday find itself in just such a situation—one side bombarded by solar rays while the other is exposed to the deep cold of outer space approaching absolute zero.

Basic Studies

OTHER problems currently under investigation already have immediate practical application. One is a study of the rest and recovery mechanism of metals under repeated fatigue cycling, which has demonstrated that the steel of a breech ring will regain some of its original properties if allowed to "rest" for a certain interval. Another defined as "analysis of a dynamic system with time-dependent products of inertia" has led to a belief that an experimental weapon's rate of fire may be considerably increased. This now is being further explored.

While the foregoing phrases may appear difficult, there are other projects that can only be described in mathematical terms. But no matter how rarefied the atmosphere of the Research Branch may seem, it is in this unit that the basic work is being accomplished that may place the weapons of the 1970's in the hands of the soldier long before that time.

TODAY, with new challenges looming against the constantly al-



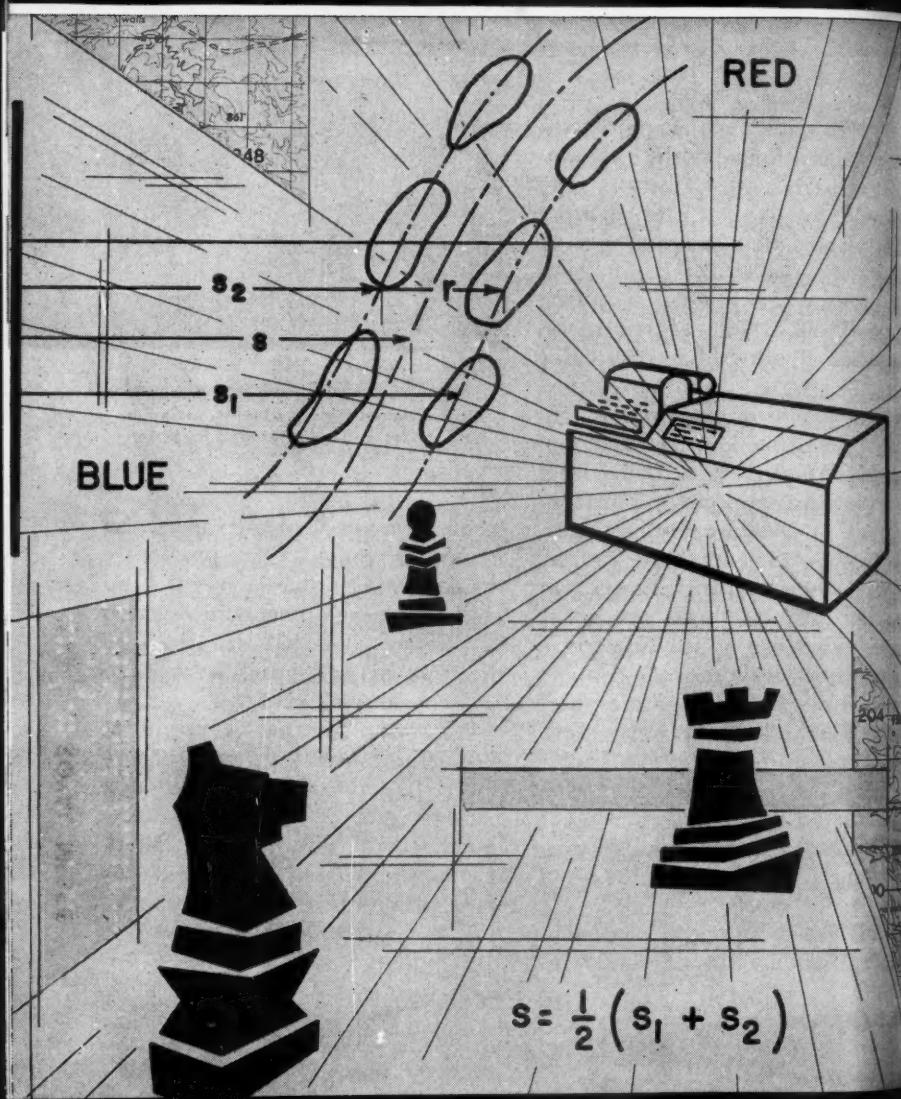
Always in forefront, Arsenal turned out the 280mm cannon to provide early capability for delivering atomic firepower.

tering framework of the future, the Arsenal is ready. Where previously the Arsenal was able merely to keep abreast of developments in research and design, it now is leaping into the van by becoming a research and engineering center.

Watervliet Arsenal is proud of past achievements during a century and a half of cycling growth and progress during which it met the challenges of war. It is confident of today's capabilities. Above all, it is ready for whatever responsibilities lie ahead, as it turns to face the challenges of tomorrow.

Even when we lose, we win as USCONARC wages

Battles Without



Bloodshed

Lieutenant General Gordon B. Rogers

THE silent batteries of old Fortress Monroe give no inkling of the battles raging within its historic confines. Few visitors to Headquarters, United States Continental Army Command (USCONARC) even suspect that here, almost completely unpublicized, a small group of military and scientific experts are fighting our wars of the future.

Without firing a shot or spilling a drop of blood, they test concepts for future warfare—five, ten or more years hence—by “playing,” in a very serious way, a large war game. Many of the questions raised and answered here have not yet been asked on the battlefield. All save valuable time and money and may one day save American lives.

There has been so little publicity concerning the War Games Division of USCONARC’s Combat Developments Section that newly assigned officers often report for duty without having heard of its operations. Here, divorced from the ad-

ministrative details and pressures characteristic of a large headquarters, the “Blue Army” battles an aggressor force called the “Red Army” through all conceivable situations and conditions.

Historic Development

WAR GAMING is not new in military history. Its roots extend back through centuries dominated by military organizations which moulded our civilization for better or worse. The ancient Greeks are said to have invented, and the ancient Persians are said to have named, the oldest war game of all—chess.

In the early 1700s, during the reign of Louis XV, a game played with cards was used in France to train military students in the basic principles of warfare. Today such activity would be called a training game. Napoleon Bonaparte used two-sided map maneuvers extensively in preparing his plans for

Battles Without Bloodshed

battle. "Operational gaming," as it is now called, has been used by every soldier who has ever stopped to scratch a map in the dirt as he plans his moves and tries to anticipate his foe's probable reactions.

War gaming as a tool for research is relatively new, however. Its development had to wait for the gradual process of evolution and growth of the "state of the art" to yield methods capable of coping with the infinite variety of the problems which may arise in future ground warfare.

Centuries were required for the necessary maturing, enriched by the tools of modern mathematical theory and electronics, to give us the capability of looking forward not just to the next battle, but to the next war. How recently this has come about is seen by the fact that war gaming has been part of US-CONARC's combat developments program only since 1954.

Training, Plans, Research

IN THE *Dictionary of United States Army Terms* a war game is defined as a "training exercise in which war is simulated on a map or sand table." This, today, is a somewhat limited definition.

A war game can be almost any

kind of military exercise that considers two opposing sides and some type of built-in control or umpiring system. It could include the map exercise, map maneuver, command post exercise (CPX), training maneuver, or games which are specifically designed to examine a given concept or activity.

The three major missions which war games perform today are to provide training, to aid in the preparation of operational plans, and to perform analytical research. In these widely separate missions, many differences occur in the conduct of play.

All Leavenworth graduates will remember the two-sided map maneuvers in which they took part. These are excellent vehicles to train individuals in the problems of senior command and to teach and practice staff procedures.

In these exercises, the maneuver clock advances at a regular or double quick pace. The players meet and solve problems under the pressure of time just as they do in war. The participants, whether they are players or umpires, do not have time to research any voluminous reference data but rely on their personal experience and knowledge to solve problems.



Lieutenant General Gordon B. Rogers
Deputy Commanding General
for Developments,
United States Continental Army Command,
Fort Monroe, Virginia.

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Those readers who have not been to Leavenworth may have participated in CPXs where the umpires, or Control as they are frequently called, acted both as evaluators and the enemy. These CPXs are valuable instruments for training and testing the efficiency of staff elements at all levels and for testing standing operating procedures. As they are used in some of our oversea commands, they also provide a valuable means of testing contingency operations plans.

To a greater or lesser degree, however, CPXs share with other map exercises the advantage of training staffs to operate quickly and efficiently against deadlines and the simulated pressures of combat. Similarly, they share the disadvantage of requiring decisions based on personal experience—or lack of it—and, in some cases, prejudice and bias. The conclusions obtained from such exercises, therefore, must be reviewed in the light of the subjective influences that have shaped and colored them.

In operational and research war games, every effort is made to reduce the personal standard of measurement and to apply objective data in coming to any conclusion. At USCONARC, the war gaming facility has been specially designed to reduce personal bias and individual inexperience and substitute for it measurements and standards that are founded on a broad base of professional experience or on detailed research.

Operational Use

SHORTLY after the war gaming group was established at USCONARC as a part of Combat Developments, it carried out an operational

game as part of the preparation for Sage Brush, the last large-scale field exercise conducted in the zone of interior.

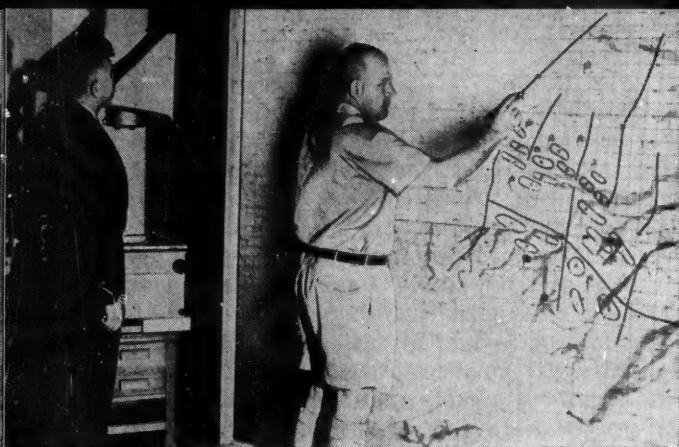
The new group war-gamed the preliminary operations plans of the opposing forces. By anticipating problems that would arise, they could give timely warning to the maneuver staff. The maneuver director was thus able to influence events so that the actual tactical play of the exercise provided maximum employment and participation for all elements of the maneuver forces.

Upon conclusion of the exercise, the maneuver director had high praise for the assistance rendered by the USCONARC War Games facility. Future field exercises, he stated, should not be undertaken until they had been thoroughly war gamed in advance to insure that objectives would be achieved.

This initial success was accomplished with only a modest investment of personnel and resources. At no time did the player and control personnel total more than 20 officers and civilian scientists.

Time Out for Research

IN THE war gaming of Sage Brush, and in subsequent war games, the USCONARC effort has differed from the Leavenworth or CPX-type war game in that there was no ticking maneuver clock to force rapid decisions. In the game as it has been designed at USCONARC, time stands still at the will of the players while a specific problem is researched and an objective answer obtained. In this way, experienced, trained personnel seek deliberate answers to the problems at hand. Since they have no personal



Map pictures projected on a screen, then photographed replace more cumbersome process of preparing overlays.

commitments in the problem, they can and do reach dispassionate, objective conclusions.

Although the USCONARC game has been used to test maneuver plans, its primary function is to assist in the analysis of concepts within the Combat Developments sphere of responsibility. The first future organization that was war gamed at USCONARC was the Pentana concept. This concept had evolved from studies conducted at the Army War College and Army Field Forces, and provided a drastic departure from the organizational concepts in effect in 1956.

The next future organization to be war gamed was the TAPFA concept. TAPFA (Tactical Atomic Plenty Field Army) was developed at the Command and General Staff College and took full cognizance of the lessons learned from the Pentana war game. The understanding gained from the Pentana and TAPFA war games was applied by the Combat Developments Section at USCONARC in developing the present approach for the 1965-1970 period.

This concept, named MOMAR, for Modern Mobile Army, 1965-1970, is currently being staffed at

Department of the Army. While it is difficult to foretell the extent of changes and modifications that may be made in this concept during study at Department of the Army level, MOMAR will provide an objective during the next ten years and will furnish guidance both for organizational changes and equipment development in that period.

The soundness of the organizational, operational and materiel concepts contained in the MOMAR study owes a great deal to the experience and understanding gained through war gaming its predecessors. Additionally, the War Games Division is currently war gaming the MOMAR concept itself in order to identify areas requiring further study or refinement.

Typical Activity

THOROUGH testing of an organization by means of war gaming prior to its adoption helps ensure that the organization finally placed in the field will be the best that USCONARC can provide.

Here is how a typical war game at USCONARC might get underway. Imagine three war rooms, physically separated, but easily accessible to each other for transmit-

ting group the I Red is a g the c To situat portr Blue tions spect lays, posin umpla vised, tions, know sourc Basea each and t To movin action ments hours For e his a fire-su plans gence provi Th forma the c Red attack will n er ha mand refer Wh both the si the fo that I matic DECEMBER

ting information or plans. One group of several officers operates the Blue War Room and one the Red War Room, while in between is a group of umpires who operate the control room.

To start a war game, a general situation and special situation are portrayed. The opposing Red and Blue Forces develop their operations plans, post them in their respective war rooms and give overlays, or copies, to Control. The opposing plans are plotted on the umpire map and each side is advised, based on his own dispositions, what he would probably know through his intelligence sources of the enemy's dispositions. Based on this initial intelligence, each side adjusts its initial plan and the game is ready to begin.

To eliminate the pressures of a moving maneuver clock, planned actions having specific time increments, usually hours or parts of hours, are developed by each side. For example: If Blue is attacking, his attack formation, dispositions, fire-support plan, phase lines, and plans for the collection of intelligence are worked out in detail and provided to the umpire group.

The umpire group takes this information and applies it against the defensive dispositions of the Red Army. At some point in the attack Control sees that the plan will not go exactly as the commander had expected and that a command decision is required. This is referred to as a critical event.

When a critical event takes place, both Red and Blue are advised of the situation by Control through the form of overlays or other media that provide them with the information they, as commanders, would

have available in combat. Each side is directed to give to the Control Group a modified plan or a new course of action. Moving from critical event to critical event, the action progresses until sufficient data have been accumulated on which to base answers to the questions that generated the war game.

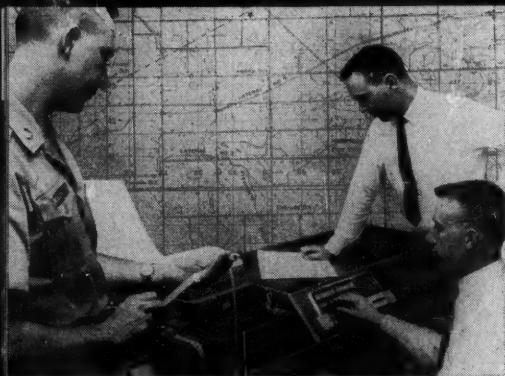
Concepts for the Future

THE utility of conducting such a game to prepare for a field exercise is apparent. Not only will it indicate if the opposing plans, when carried out, will accomplish the mission of the exercise; it also will alert the maneuver staff to those areas and situations where positive control by the staff will be needed to keep the exercise from going astray.

However, most of the effort of the War Games Division in the past three years has been in the area of research aimed at evaluating future organizations, and here the problem is much more complicated. The players and Control in these instances move on to a future battlefield to test organizations that are only in the conceptual stage, using equipment not yet developed.

Obviously, positive quantitative answers cannot be obtained. However, the stress and strain of simulated combat does reveal to trained observers the strength and weaknesses of a proposed organization.

The game may indicate that the authors of the new organization erred in believing that certain activities would not be required on the future battlefield. For example, when the Pentana study was drawn up, its authors thought that the future environment was such that combat engineers would no longer



Many primarily arithmetical tasks are being assigned to small electronic digital computer to speed evaluation.

be required as integral parts of the Division. Actual play of the game, however, revealed that despite improved cross-country mobility of the simulated future combat and service vehicles, the requirements for removing blowdown, preparing approaches for stream crossings, and negotiating vertical banks were of such a magnitude that engineers would still be required as an organic part of the division.

In addition to evaluating operational and organizational concepts, the War Games Division also provides an office of record and a source of experience in war gaming methods and procedures for other interested agencies. War Games files are being tapped frequently by United States industrial firms which produce the weapons systems and tools of war.

Improving Capabilities

CONTINUAL efforts to improve our techniques and capabilities for war gaming are directed into three areas—making the game more valid, reducing the effort necessary to perform the various evaluations needed during play, and improving flow and storage of information.

The task of improving validity is one of making the game accurately evaluate the interactions between the opposing forces. This involves finding better mathematical descriptions of the interactions involved as well as constantly improving or “up-dating” data on lethality, reaction times, detection probabilities, and the like.

The tool employed to record and disseminate this information is a War Gaming Handbook. It is given wide distribution both within the Department of Defense and to numerous civilian contractors and agencies. The handbook is revised periodically and serves continuously as an SOP for daily operations within the War Games Division to insure the validity and objectivity of the game.

To reduce the effort involved in making needed evaluations, a small electronic digital computer is available. It is used for such things as evaluating casualties due to conventional or atomic artillery, infantry engagements, and tank or tank-antitank firefights. As time goes on, more and more such tasks which are primarily arithmetical in nature will be assigned to the computer. The use of large computers to play major portions of the game has been discussed but rejected as impractical at this time.

To improve the flow of information and help reduce the associated paperwork, a new display system is currently being installed. This system uses map pictures which can be projected on a screen and photographed to replace the more cumbersome preparation of overlays.

Additionally, work is underway to simplify the bookkeeping effort associated with data storage. Even-

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ually the files on units which show strengths, casualties, logistics situation, position, and similar data, may be put on tape or punched cards. Already the computer is used for keeping an intelligence file up-to-date and deciding, on the basis of the probabilities involved, which units are detected and at what time in the course of the play.

Limitations and Possibilities

MANY research organizations, both civilian and military, have sent scientists and researchers to Fort Monroe to evaluate the functioning of their developments in equipment and weapons in future combat. To be able to do this before materials are actually in mass production offers untold potential savings—not only to industry but to the taxpayers.

While there are many things war games can do, there are also things they cannot do. War gaming *cannot* give final answers to all our problems, nor can it offer *proof* that one organization or one tactical concept is undeniably better

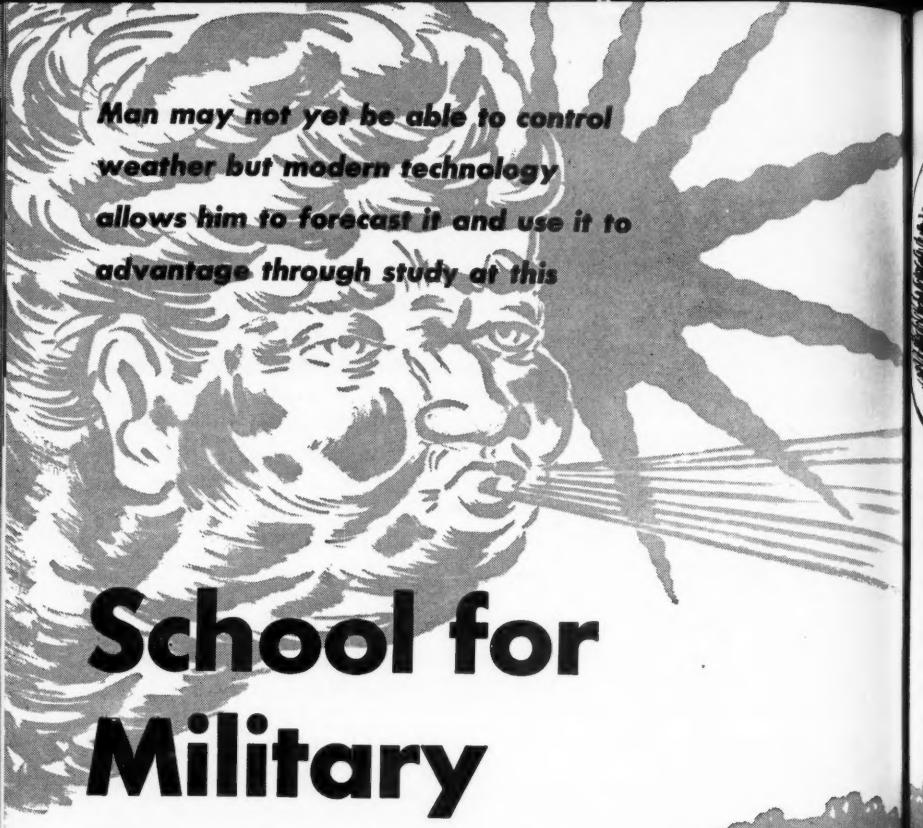
than another. No definitive answer is provided as to success or failure.

The intangibles of war are such that a war game cannot fully evaluate the extremely important factors of esprit de corps, morale, personalities, individual abilities, and the effectiveness of units. The use of probabilities, which are an important tool in war gaming, does take into account some of these factors, but only to a limited extent. Obviously, it is difficult to simulate guerilla warfare, psychological warfare and other types of warfare which concern the national pride of people, the courage and resourcefulness of many individuals, the will to resist, and the effectiveness of propaganda.

Nevertheless, we at Headquarters USCONARC are convinced that research war gaming has quickly come of age—it is here to stay. As a technique, gaming offers a stimulating and challenging medium for arriving at useful judgments in problem areas which cannot be readily approached in any other manner.

Analyzing concepts by war games methods aids in reaching objective conclusions on probable future operations.





**Man may not yet be able to control
weather but modern technology
allows him to forecast it and use it to
advantage through study of this**

School for Military Meteorologists

Anthony D. Kurtz

ASUDDEN sleet storm nearly wrecked George Washington's careful plans for the famed Christmas Eve crossing of the Delaware...

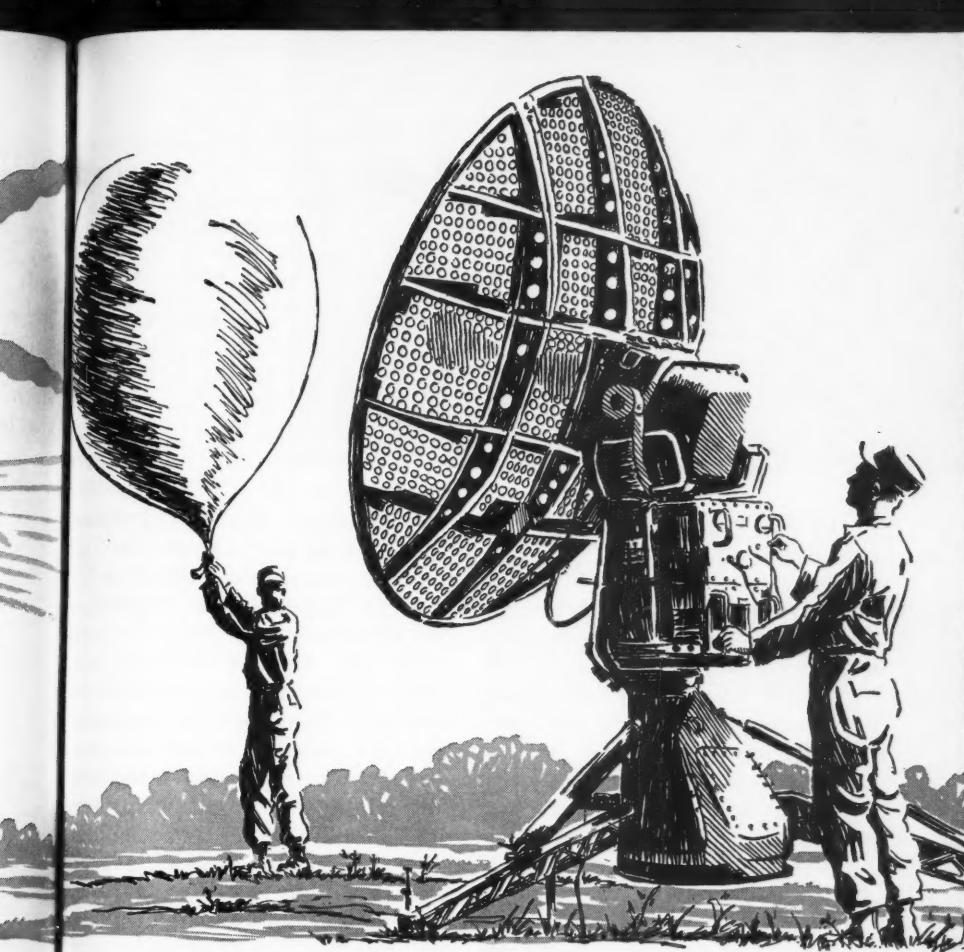
An unusually severe winter did more to decimate Napoleon's armies retreating from Moscow than enemy troops...

Overcast skies and snowstorms during the Battle of the Bulge grounded Allied aircraft, allowing

ANTHONY D. KURTZ is an instructor in the U. S. Army Signal School Weather Course, Fort Monmouth, New Jersey.

the German attacking forces to succeed initially...

The incidents and accidents attendant on weather can be multiplied thousands of times from military history. General Eisenhower's entire planning for the Normandy invasion hung on the weather. If the Channel were to be stormy during the crucial period when other factors allowed a crossing, the entire operation would have had to be put off, perhaps for months. By the narrowest of weather margins



the operation was carried out. Even so, the storms that followed the crossing wrecked the port facilities.

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TODAY the increased mobility of military forces and the expanding area over which they will be called on to operate under conditions of nuclear warfare, render even more important an understanding of weather—that inescapable phenomenon that can be friend or foe depending on the meteorological data available to the military commander.

The U. S. Army has long been aware of the important role that

meteorology plays, in peaceful civilian pursuits as well as in the military field. The first formal weather service was formed by the Signal Corps in 1870—and even before that surgeons at widely scattered Army posts were gathering meteorological information, though not on such a formally organized basis.

Military meteorology was well established in the Army during World War II, when weather forecasting was widely and intensively used in preparing for air strikes and also for ground activities. When the Air Force became a separate service in 1947, control of



Student tracks weather balloon with theodolite as another records the data from high above the earth's surface.

weather services went to the new organization.

During the Korean War, however, it became increasingly evident that the Army's primary weather needs were of a specific nature. Information was needed from many observation posts within a relatively small area to facilitate tactical operations of ground troops and support units. To provide such micro-scale data for the weather experts, trained observers were needed.

In 1952 the Army established a six-week Meteorological Observation Course at Fort Monmouth, New Jersey. Here personnel were trained to make detailed surface observation and gained familiarity with techniques used in winds-aloft soundings.

In 1955 the course was extended to thirteen weeks, and with the end of hostilities a new and equally vital role was assumed by graduates of the U. S. Army Signal School Weather Course. These men were called on to support an extensive meteorological research and development program within the Technical Services.

Graduates of the School now render important services to troop commanders who must have a

knowledge of weather conditions for planning purposes and for aiming the longer-range missile weapons. In addition, they supply data for Quartermaster Corps investigations into weather elements that affect both men and equipment, for Chemical Corps use in countering chemical, biological and radiological agents and predicting the ensuing fallout, for Corps of Engineers operations on the Greenland Ice Cap, and for other technical service agencies.

The wide and varied utilization of weather observation experts throughout the Army is evident in the list of installations to which graduates may be assigned—Army Signal Research and Development Laboratory, Fort Monmouth, New Jersey; Army Electronic Proving Ground, Fort Huachuca, Arizona; White Sands Missile Support Agency; Yuma Test Station; Dugway Proving Ground, Utah; U. S. Army Chemical Corps Center, Edgewood, Maryland; Quartermaster Corps installations at Natick and Maynard, Massachusetts; to micrometeorological stations in Puerto Rico and Panama. Currently a team is on the Greenland Ice Cap giving meteorological support to various technical groups.

Training Phases

THE graduate of the Weather Course is a triple-rated man. He can take surface observations, visual upper air soundings and electronic upper air probes. He gains this knowledge in three phases in a specialized meteorological course at Fort Monmouth.

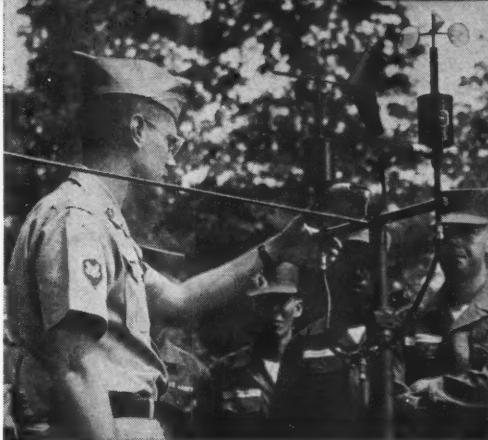
To qualify for enrollment in the Meteorological Observers Course leading to MOS 905.1, the young soldier must be a high school graduate with one year of physics and an Army Aptitude Area I score of 100 or above.

The first four weeks of training are devoted to introducing the student to meteorological theory, instrumentation and weather observing techniques and procedures. He learns about the different layers of atmosphere surrounding the earth by studying the physical properties of each layer and their effect on weather.

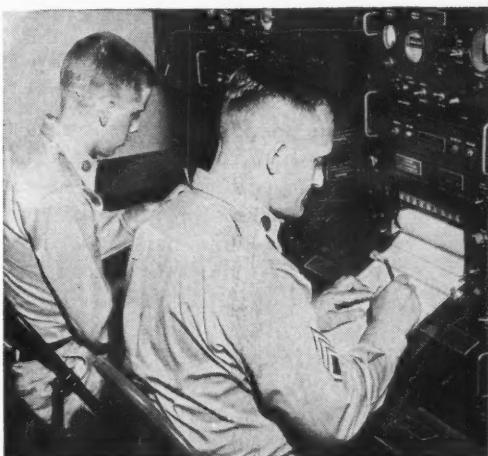
Following that comes a study of the world-wide circulation pattern of air. The student learns that certain geographical locations have semi-permanent areas of either high or low pressure. He learns about the forces that come into play to change this pattern—gravity, centrifugal force, and Coriolis force, for instance.

Coriolis force is but little known to the layman; it is a deflecting force that acts on any body in motion, whether a projectile or a large storm center, due to the earth's rotation. Thus horizontal motions are diverted to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. Obviously it is important in aiming missiles.

The student in this first phase

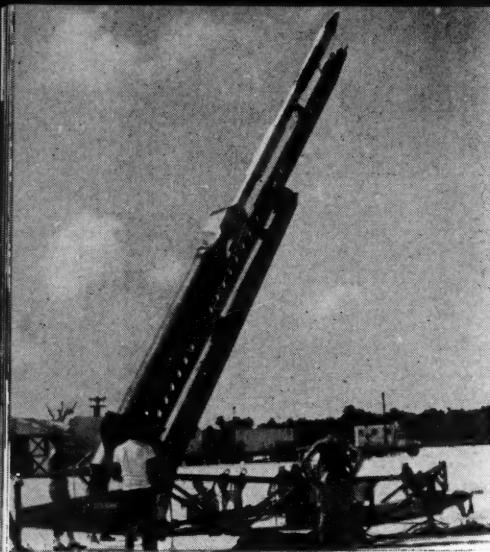


Students above learn about low-level wind measuring equipment while below others record data sent from radiosonde.



Temperature and relative humidity data are recorded by meteorological student from delicate instruments in shelter.

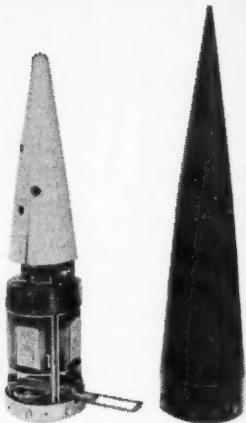




Nike-Cajun rocket takes weather devices 60 miles up. Radiosonde, right, is hurled up to 200,000 feet, returns by parachute.

goes on to learn about weather "fronts"—the boundary line between two different types of air masses which occur when air may stagnate for some period of time. The air overlying such geographical regions acquires the same characteristics as the ground over which it lies. These areas are known as air mass source regions. Associated with a frontal activity may be low or high pressure areas, clouds, and resulting changes in weather conditions. The student learns in detail the descriptive physics and the associated weather involved.

Meteorological Instrumentation is another important part of the curriculum in this phase. The student learns about the various types of fixed station equipments used to measure meteorological parameters. The siting, installation, operation, first echelon maintenance and interpretation of meteorological graphs and charts also are taught. The student studies the various types of weather reporting



forms, rules governing their entries, and accepted observing techniques.

Instruments and Techniques

IN THE second four weeks at the school the student is introduced to procedures, devices and techniques used in making winds-above and micro-meteorological observations. Equipment is portable and well suited to the needs of a field army. It also is of value in various research investigations.

One area of particular interest to the Army is micro-meteorology. It is known that upper portions of the troposphere have a definite circulation pattern. The Army is interested in determining whether a similar pattern exists in the lower portion of this earth envelope.

The student learns to use such instruments as the theodolite, wind equipments, pyrheliometers and radiometers. Theodolites track the sounding balloons that are sent aloft to study upper atmospheric conditions, providing data of importance in missile launching. The Chemical Corps also is interested in upper air conditions and their effects on use of CBR agents. Wind equipments measure small-scale wind speed and direction de-

iations. Pyrheliometers and radiometer instruments measure solar and terrestrial radiation.

Rather new in the field of meteorology today is the use of thermocouples—a familiar but heretofore not much used electrical phenomenon that produces energy when heat is applied to couplings of two different types of metals. Thermocouples now are used to measure minute temperature changes at various heights both above and below the earth's surface. Such measurements have proved important in Quartermaster Corps research into the weather elements affecting both men and equipment.

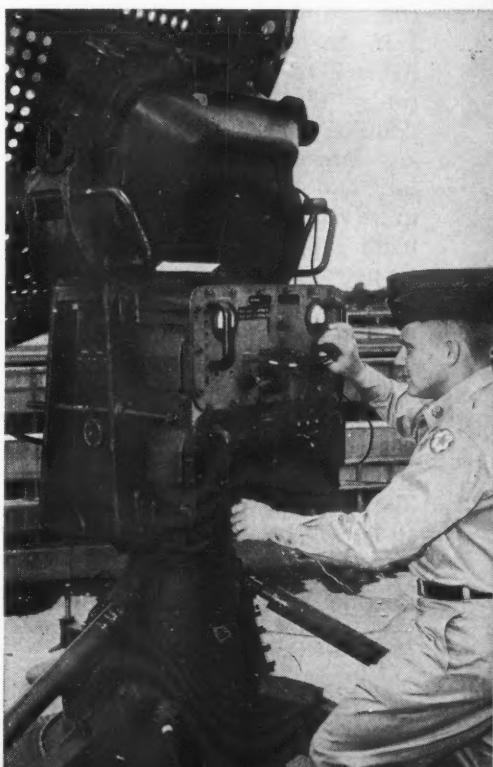
IN Phase III the student is trained to obtain, record and evaluate upper air data by use of radio direction-finding equipment. This entails use of a modulator and transmitter which relays signals to a ground receiver from a balloon which may reach up to 100,000 feet before bursting. Individual components and preflight testing prior to release of the balloons or radiosonde also is taught.

Indications of atmospheric changes in temperature and humidity—of critical importance in many areas of weather work—are transferred to charts and graphs using specially constructed circular interpreters. The temperature and humidity values then are calculated for significant heights above mean sea level with aid of a pressure calibration chart. Information from radiosonde flights is used in making air mass analyses as well as calculating the stability index of the atmosphere—all military data of significance to artillery as well as the Chemical Corps.

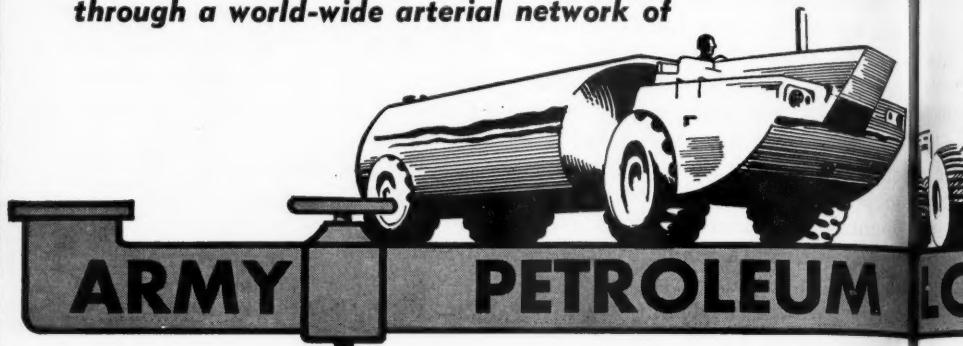
AS IN the old saying attributed to Mark Twain, nobody can actually do anything about the weather—but its vagaries can be foretold. Merely projecting current trends, it is likely that knowledge may well increase to the point where something can be done about controlling it.

Meanwhile, graduates of the U. S. Army Signal School Weather Course are proving their capability in performing all the varied duties necessary in gathering, charting and interpreting all the meteorological data that allow commanders in the field and scientists in the technical services to use existing knowledge to the greatest military advantage.

Rawin set is radio direction finder that records weather data sent back from high atmosphere by balloon-born transmitters.



**By tanker, transporter and pipeline,
Quartermaster Corps keeps precious POL surging
through a world-wide arterial network of**



Colonel Paul B. Tonks

PETROLEUM, the lifeblood of modern technology, plays a key role in the American economy. Approximately two thirds of the total energy utilized in our everyday lives is derived from this vital commodity.

In the military sphere alone, Army POL (petroleum, oil, lubricants) requirements have almost doubled since World War II. On any future battlefield, highly mobile and dispersed units will require continuous and rapid petroleum supply support. Under anticipated combat conditions, it is estimated that approximately 60 percent of all supplies shipped overseas will be POL.

In keeping with Department of Army policy to reduce logistic tonnages and eliminate non-essential supplies and services, the various Technical Services are endeavoring to reduce petroleum product requirements. The Quartermaster

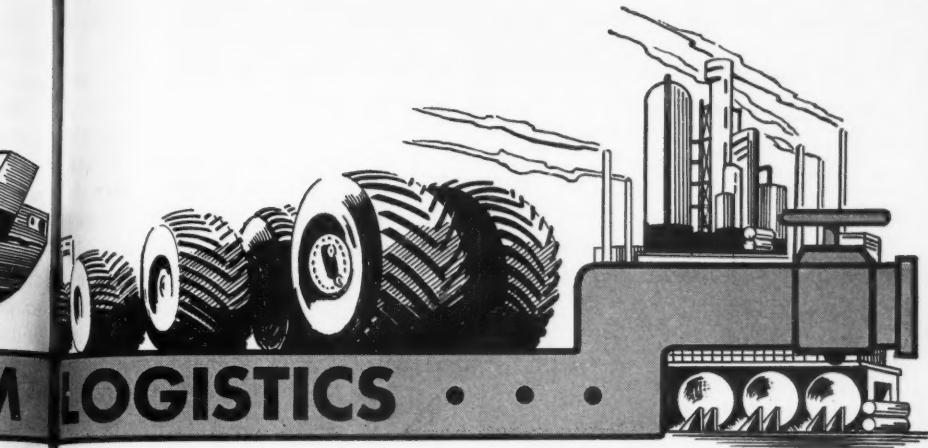
Corps, which has responsibility for supply and distribution of petroleum within the Army, is deeply concerned with the logistical aspects. Ordnance Corps research effort is being directed toward development of more efficient types of engines, and reduction in the number of fuels.

Some of the new type engines and fuels under study or development include fuel injection, gas turbine, free piston-turbine and multi-fuel engines; and electro-chemical energy sources, high energy fuels (exotic fuels) and nuclear energy. An example of progress in this field is the new diesel-powered M60 Tank, which will replace the gasoline-powered M-48A2 Tank. The M60 requires about 165 gallons of fuel to travel 100 miles as compared to 240 gallons for the M-48A2.

Control Agencies

BECAUSE of the critical importance of petroleum products in national life, many organizational ele-

COLONEL PAUL B. TONKS, Quartermaster Corps, is Chief, Petroleum Division, Office of the Quartermaster General.



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ments have been established within the Federal Government for its control and management. Within the Department of Defense, each of the three Military Departments is assigned vital roles in petroleum logistics. The Departmental agencies function under broad policy guidance of the Joint Chiefs of Staff (J-4 Logistics) and the Office of Petroleum Logistics Policy, Assistant Secretary of Defense (Supply and Logistics).

The Secretary of the Navy is the Department of Defense Single Manager for Petroleum. His Single Manager functions are performed by the Military Petroleum Supply Agency, under supervision of an Executive Director. The Single Manager's primary purpose is to preclude duplication of procurement effort. Responsibility for funding, ownership of stocks and operation of distribution systems, however, remains with the respective Military Departments.

Within the Army, the Deputy Chief of Staff for Logistics super-

vises all petroleum activities; he provides guidance and approves broad plans for supply and distribution, establishes priorities and allocations.

Petroleum logistics functions are assigned within the Army to the various Technical Services in accordance with their missions and specialties. The Quartermaster General is assigned the principal logistics functions. He administers the Department of Army development, procurement, and supply system for petroleum products and related equipment.

A Department of Army Petroleum Panel acts as coordinating agency for the Technical Services. This Panel, under the supervision of the Deputy Chief of Staff for Logistics and chairmanned by the Quartermaster Corps, monitors and coordinates planning and policy matters in the field of petroleum supply and distribution.

To coordinate petroleum supply in a unified command, the Commander establishes a Joint Petro-

Army Petroleum Logistics

leum Office which functions as a staff agency under the J-4. The Joint Petroleum Office advises the J-4 on allocation of petroleum products; it also provides guidance and prepares joint plans and policies. The Theater Army Commander, when so directed by the Commander of a unified command, establishes a Joint Area Petroleum Office — normally headed by the Theatre Army Quartermaster.

Center Activities

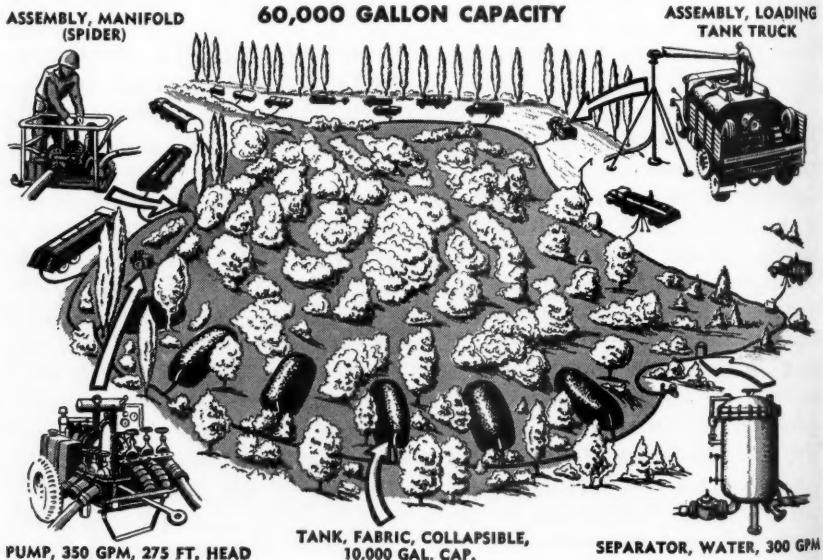
THE Quartermaster Petroleum Center in the Office of the Quartermaster General is the Army National Inventory Control Point for petroleum. Besides assuring effective supply of POL to Army forces on a world-wide basis, it is responsible for managing the supply and procurement of petroleum containers (cans and drums). The Center also maintains continuous

surveillance of depot stock levels to insure their adequacy.

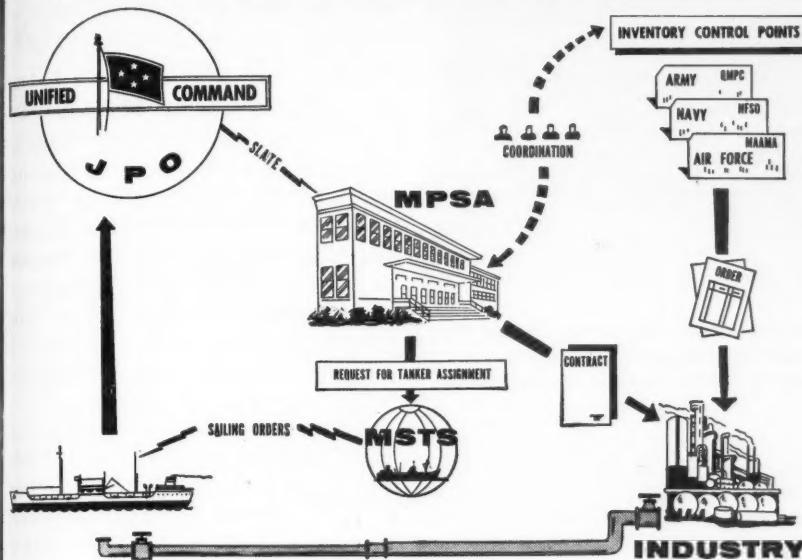
The Center prepares six- and twelve-month advance forecasts of Army petroleum procurement needs, then places a procurement requirement on Military Petroleum Supply Agency (MPSA), which makes the necessary contracts with commercial suppliers. Posts, camps and stations in continental United States order deliveries against the established contracts for most items used in volume. Some items are requisitioned from depots or purchased locally.

Oversea requirements are of two types—slated and non-slated. The slated items are contracted for by Military Petroleum Supply Agency at the request of the Quartermaster Petroleum Center. The Center initiates delivery orders against the contracts to meet monthly requirements of the Army portion of the

Portable Class III Supply Point Assemblage permits unloading of three 5000-gallon tank trucks and filling of six 1200-gallon trucks simultaneously.



PETROLEUM SUPPLY SUPPORT TO OVERSEA AREAS



oversea slate except for bulk fuels. MPSA places the delivery orders for the bulk fuels.

Non-slated oversea requirements are requisitioned from the appropriate oversea supply agency in continental United States which in turn extracts the requisition to the source of supply—i.e., depot, regional purchase office or the Quartermaster Petroleum Center. The Military Sea Transportation Service then arranges for movement of POL to oversea areas. (See above).

Quality Controls

THE trend toward greater mechanization, with more powerful and complex equipment, necessitates a vigilant Quality Control Program to assure that stocks of petroleum products will be satisfactory when used for their intended purpose. Within the Army, the Quartermaster Corps is responsible for quality control, using standards and specifications developed by the Ordnance Corps.

Quality control includes two types of inspections—procurement and quality surveillance. Procurement inspections insure that petroleum products meet military specifications at the time of government acceptance. To prevent duplication and overlapping, the Department of Defense has established procurement inspection areas within the Continental United States for each Military Department.

Quality surveillance inspections assure the quality of products from the time of government acceptance until they are consumed. A similar division of inspection responsibilities is utilized in oversea areas.

Additional interservice agreements deal with purchasing, trans-



Rolling Liquid Transporter is tested for operating efficiency in extreme cold during 1,800-mile trek in Greenland.

port (including pipelines), provision of storage facilities, laboratory usage, and petroleum sales to the ultimate user.

Speeding Distribution

TO satisfy the rising demand for petroleum products, the Army has developed a fast, responsive and economical distribution method based on the principle of "delivery in bulk as far forward as possible." Today petroleum is distributed primarily in bulk form by tank trucks, trailers, tank cars, barges, pipelines.

By using special conversion kits, cargo vehicles may be converted into bulk petroleum carriers, mounting two 600-gallon tanks on a 2½-ton general-purpose truck and a third 600-gallon tank on a 1½-ton trailer. The tanks may be connected by a series of hoses to a rear-mounted dispensing assembly.

Other conversion kits utilizing collapsible containers are under development. A collapsible 500-gallon container will provide an aerial delivery means for supplying units in airheads or isolated locations. Another collapsible container of

approximately 6000-gallon capacity will be used to convert gondola cars, flat cars, and barges into bulk petroleum carriers.

POL for Combat Mobility

IN THE forward area, there is a requirement for a more mobile overland means of moving products. The Ordnance Corps is currently developing a GOER family of high mobility, large-payload vehicles which will provide a bulk petroleum transport capability within divisions and petroleum supply units of the field army. As another means of overcoming this gap, Transportation Corps is developing the rolling fluid transporter.

The Corps of Engineers is developing a collapsible hosesline system which, if adopted, will save time and effort in construction of pipelines and reduce the requirements for other means of overland transport. The hosesline can be laid out from a moving vehicle and operated within a matter of hours.

The recently standardized Class III Supply Point Assemblage provides additional support to combat units in forward areas. With a storage capacity of 60,000 gallons, the Assemblage permits the unloading of three standard military 5000-gallon tank trucks and filling of six 1200-gallon trucks at the same time. It can be operated as one unit or as two separate units.

All this is indeed a far cry from the old method of storing and distributing petroleum in 5-gallon cans and 55-gallon drums. Adoption of the bulk distribution method has drastically reduced the requirement for cans and drums; the latter are now used primarily for storage and distribution within

individual military organizations. In keeping with this new emphasis, TOE units have been reorganized to provide bulk capability, and current research and development programs authorize the development of the additional equipment required to implement fully the bulk distribution method.

Oversea Supply

FURTHER progress in bulk supply is evidenced by Army pipelines systems and streamlined distribution methods overseas. The Army has constructed pipelines in Alaska, Europe, and Okinawa, and has contributed financially and technically to the 2600-mile NATO Pipeline System in Europe. The Alaskan Petroleum Distribution system extends from Haines to Fairbanks. In Europe, the U. S. National Pipeline System extends from Donges to Metz, France, and from Zweibrucken to Germersheim, Germany. This system is connected by the NATO line from Metz to Zweibrucken. The Okinawa Petroleum Distribution System consists of some 100 miles of pipelines and terminal storage facilities.

Distribution in Europe has been further simplified by an automatic supply plan which furnishes timely information for pipeline movement and tanker scheduling. The plan is based on a close working relationship between supplier and consumer. Both the Quartermaster Petroleum Distribution Command and the Terminal District Commanders maintain accurate stock status and consumption data for each customer. From this information the Petroleum Distribution Command predicts future consumption. The system insures

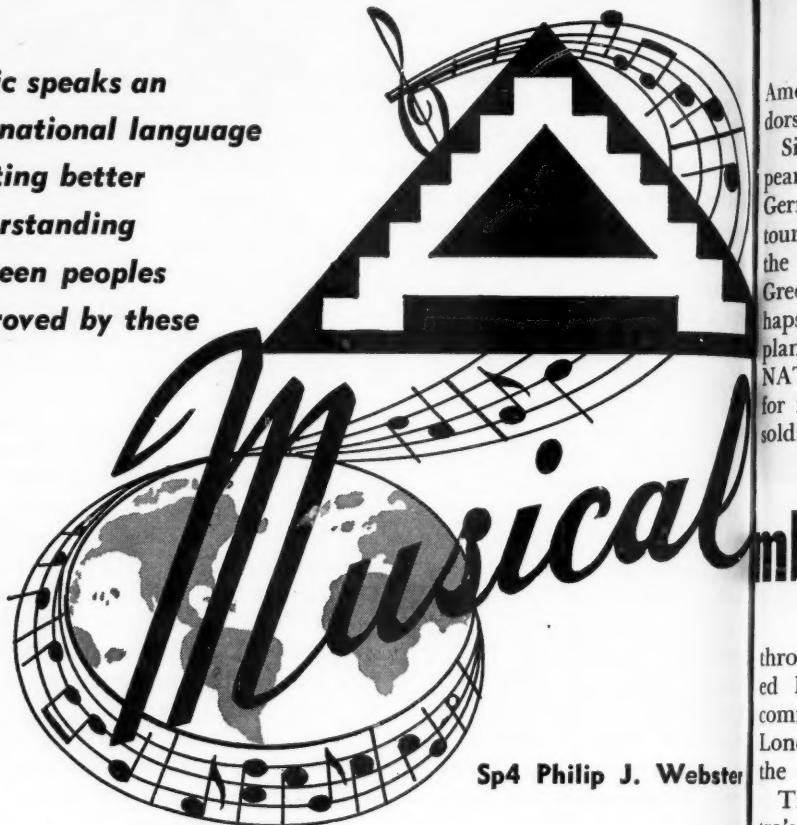
that unit reserves and operating stocks are maintained at optimum levels. Moreover, it is readily adaptable to wartime conditions.

MARKING still another innovation, the Theater Army Organization has been revised to provide for a Petroleum Intersectoral Service (POLIS) under control of Quartermaster, Theater Army Logistical Command. POLIS operates and maintains the petroleum distribution system during wartime to insure an uninterrupted flow of petroleum products to using units. Its basic operating principles insure maximum utilization of capabilities and ease of operations for the Technical Services involved. In Europe, this task is now being performed by the Quartermaster Petroleum Distribution Command. In addition to operating the pipeline, the Command has operational control of Transportation Corps rail tank cars and the Transportation Corps Medium Truck Company (Petroleum).

WITHOUT a continuing supply of petroleum, oil, and lubricants speedily delivered under rigid quality controls, the Army's planes, tanks and other vehicles would grind to a halt. The wings, treads and wheels which signify a truly modern Army would lose their prime attribute of mobility.

Recognizing the vital nature of this commodity, the Quartermaster Corps has streamlined its logistical organization and improved its distribution and supply methods, to insure that fuel deliveries to power the engines of war shall keep pace with the fast-moving requirements of tomorrow's battlefield.

*Music speaks an
international language
creating better
understanding
between peoples
as proved by these*



Sp4 Philip J. Webster

THE roles of soldier, ambassador and classical musician are generally considered as worlds apart, but in Stuttgart-Vaihingen, West Germany, seventy American soldier-musicians are dispensing classical music and making friends for America while doing it.

Since 1952, the Seventh Army Symphony Orchestra has amazed European audiences. Travelling over 170,000 miles and performing to more than half a million European and American music lovers, these ambassadors in Army Green have helped convince Europeans that America is not only the country of missiles and big cars, but a land

with a fine cultural heritage as well.

As the *Zeitung* of Heidenheim, West Germany said in a recent review: "During its existence, in which time it has become an orchestra of worldwide reputation, it has done more to promote friendship between the peoples of the Old World and the New than words might ever have done."

The Orchestra was organized in June 1952 by Corporal Samuel Adler, a young musician and native of Germany, who realized what an important job such a group could do in providing good symphonic music for American troops stationed in Germany. Shortly thereafter, the Orchestra took on the much bigger job of serving as one of

Sp4 PHILIP J. WEBSTER is Publicity Director, Seventh U. S. Army Symphony Orchestra.

America's major cultural ambassadors abroad.

Since its beginning, it has appeared in virtually every city in Germany, as well as making special tours to Italy, France, Luxembourg, the Netherlands, Great Britain, Greece, Austria and Denmark. Perhaps the most ambitious tour ever planned by the Symphony was the NATO tour in early 1955, when for four months the contingent of soldier-musicians blazed its way

problem of rotation. In its eight brief years, the Seventh Army Symphony has seen better than 500 musicians come and go. In an effort to overcome effects of such frequent changeovers, the Orchestra receives assistance from directors of American universities and conservatories, and from conductors of leading symphony orchestras. Thus, when a qualified symphonic musician is about to enter the service, Seventh Army Symphony officials usually

ambassadors in Army Green

through France, Italy and the United Kingdom. High point was a command performance given in London's Royal Albert Hall before the Queen Mother.

The best known of the orchestra's concert appearances took place in October 1958 when the Symphony presented three concerts in the American Pavilion at the Brussels Exposition.

Interesting incidents of good-will surround almost all of the orchestra's appearances. At the final American Pavilion concert in Brussels, an elderly couple arrived too late to get tickets.

"Too bad," said the couple, "We've travelled all the way from the Hague to hear them. We learned about them from friends who had heard them in London." A soldier on leave overheard their remarks and gave them his tickets.

High Caliber Musicianship

THE professional quality of the Orchestra is maintained despite the

know his name and have already corresponded with him.

The changeover in conductors is just as rapid as with the musicians. There have been 13 so far, the latest being 26-year-old Sergeant Ralph H. Lane, an accomplished musician who also is a lawyer, admitted to the Federal bar earlier this year. A graduate of the University of Rochester and Harvard University, he attended the Eastman School of Music. He has studied music since he was five, has played with the Chicago Youth Orchestra, the Corning Symphony Orchestra, and has conducted choral and orchestral groups.

Backgrounds of most of the musicians are impressive. Many come directly into the Army from such groups as the New York Philharmonic Orchestra, the St. Louis, San Francisco, and New Orleans Symphonies. Many come from noted musical families. Some have had professional experience with foreign orchestras.



Many hours of individual practice and unit rehearsals go into each concert by the Seventh Army Symphony, here prepared for a formal appearance in Stuttgart.

While music is their major avocation, many of the musicians have held full or part-time jobs quite unrelated to their musical interests. Laboratory technicians, newspaper reporters, insurance salesmen, photographers, lawyers, teachers and even a missionary have been among their ranks.

Behind the Overture

A GREAT amount of work goes into making each concert a success.

First and most important, of course, is the vast amount of practice each member of the orchestra spends on his instrument. Then come the countless hours the Symphony spends in rehearsal. The final result is a finished and polished performance.

Behind-the-scenes administration is just as thoroughly planned and executed. Concert dates are planned months in advance by the Symphony Booking Section. Then, before a tour is launched, the Symphony's advance man is sent out to handle housing and messing arrangements for orchestra members,

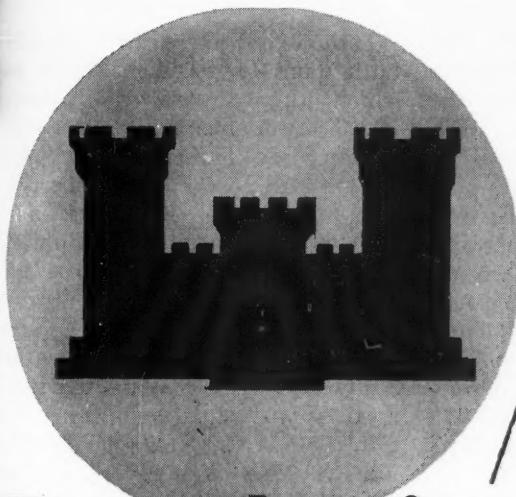
as well as checking the acoustics, lighting and stage space.

By this time, music for the tour has been ordered and posters and press kits have been sent out by the Publicity Section. Shortly before the concert date, programs are printed with the latest list of orchestra personnel, an up-to-date history of the orchestra, and the final selection of numbers to be played as chosen by the conductor and the Musical Director, Captain Arthur W. R. Shettle.

Though their schedule is enough to overwhelm even the best of professional symphony orchestras, Seventh Army's musicians feel amply rewarded with their success as ambassadors.

As Dr. James B. Conant, noted American educator and a former High Commissioner to Germany, wrote after hearing the Orchestra: "This group of young Army musicians has done more than any other single military unit in Germany to promote a better cultural understanding between the American and German peoples."

**The Nation's watershed problems
are projected in panoramic
miniature as the Corps of Engineers
demonstrates its role in**



Developing Our Water Resources

Alfred Rosenthal

OUTSIDE it may be fair weather, but every day of the year inside the Chicago Museum of Science and Industry on the city's lakefront, there will be one area where lightning will flash, thunder

will roar and heavily laden clouds will produce rain storms. However umbrellas are not needed. The cloudburst is just one of the many features of a permanent exhibit built by the U. S. Army Corps of Engineers, to demonstrate its role in harnessing, channeling and safeguarding the water resources of the entire Nation.

ALFRED ROSENTHAL, formerly Technical Liaison Officer, North Central Division, Corps of Engineers, is Visual Information Officer, U.S. Army Exhibit Unit, Cameron Station, Va.



Typical civil works activities are portrayed graphically in this portion of a 70-foot long river basin model.

Titled "Water for America's Future," the display is a composite replica of selected sections of the Nation's countryside—areas with water-filled lakes, reservoirs, rivers and canals teeming with shipping and other activity. With its constantly flowing waterway network stretching through the wide countryside, it enables visitors to watch accurately scaled models of dams, canal locks, hydroelectric plants, bridges, inland waterway barges and dredges going through the same operations as their real prototypes.

The exhibit is designed to demonstrate realistically how the Army Engineers serve the Nation in the development of water resources. It shows that although water quenches thirst, helps to grow food, safeguards sanitation, puts out fires and produces energy for industry, it can also, when uncontrolled, be the agent of disaster, destroying homes, eroding farmlands, flooding communities and bringing death to thousands.

Visualizing the Problem

PORTRAYED in the large display which fills the museum's entire south balcony are specific examples of how the Corps of Engineers has harnessed Nature's water potentialities.

It shows how the Army Engineers built dams to create reservoirs in which otherwise destructive waters may be temporarily stored for useful purposes. These same reservoirs can be utilized for water conservation, recreation and pollution abatement, and the impounded waters, upon release, can turn turbines for the generation of hydroelectric power.

Other responsibilities of the Army Engineers are visualized, such as their work to develop the Nation's waterways for navigation. This involves breakwaters, navigation channels, locks and dams to serve as "step ladders" for heavily laden ships and barges which supply a growing America.

A separate display in the new exhibit area tells visually and orally the activities of the Corps of Engineers in building the navigation lanes serving the Great Lakes, Mississippi River and St. Lawrence Seaway systems. Army Engineers only last year completed the U. S. portion of the St. Lawrence Seaway now linking the Great Lakes with the ports of the world.

Building for the Future

EVER since the Army Corps of Engineers was first assigned its civil works mission 136 years ago it has designed, constructed and operated

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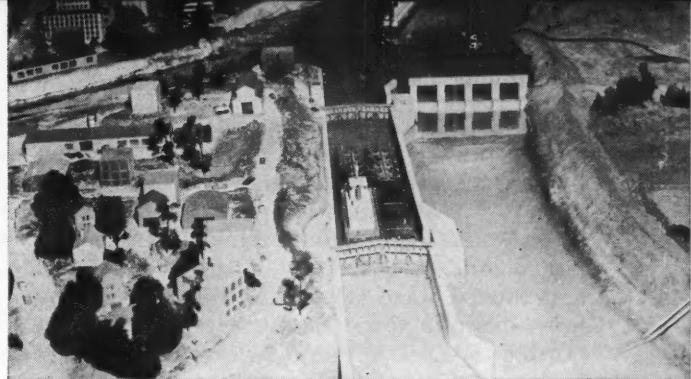
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Model barge negotiates a navigation lock—typical of those built to facilitate traffic on the Nation's waterways.



vital public works for protecting the American people and advancing the national economy, in addition to its important military engineering duties.

Its first civil works task was begun in 1824 when Congress directed the Corps of Engineers to begin opening up and improving the rivers and harbors and to develop a national transportation system that would weld the Nation together.

Gradually Congress expanded the "civil functions" role to embrace, in addition to rivers and harbors, the inauguration of railroad construction, the mapping and opening of the West, construction of many of the monuments and buildings of the Nation's Capital, and other engineering tasks including completion of the Panama Canal.

THE current century saw the rise of the Nation's water resources problems and with it the broadening of the civil works program to deal with them. Flood protection, hydroelectric power development and aid to irrigation expansion in the West were added to the Corps' activities.

More recently, as the country changed to a predominantly urban-industrial society, rapid population growth and accompanying indus-

trial expansion brought about tremendous increases in water resources requirements. Many additional responsibilities in this field have been placed upon the Corps—among them, the conservation of water for municipal and industrial uses, alleviation of stream pollution, provision of facilities for improving fish and wildlife resources, creation of public recreational opportunities on Corps projects, protection of beaches and the seacoast from erosion, and others.

Thus the Army Engineers are now engaged, nationwide, in activities both to meet our rapidly growing immediate water resources needs and to assure the fullest ultimate conservation and use of these limited resources for the future. These activities are being carried out in cooperation with other Federal, state and local agencies.

Range of Activities

THE program currently embraces more than 3,000 active projects, including those completed, now under way, and authorized for future construction. This work, directed by Congress, now approaches an annual investment of one billion dollars.

In the field of navigation, the Corps has improved some 23,000 miles of waterways of which about

Developing Our Water Resources

10,000 miles accommodate the 9-foot depth required for modern barge transportation on major waterways. Commerce on United States waterways has doubled in the past decade, is increasing steadily, and totaled some 189 billion ton-miles in recent years. Industries requiring the transportation of heavy, bulk materials are attracted to sites along the improved waterways where low-cost barge transportation and dependable water supplies are available.

Over the years, some 500 harbors have been improved on the Atlantic, Gulf and Pacific Coasts, on the Great Lakes, in Alaska and Hawaii. These modernization projects keep pace with advancement in vessel design and the growing importance of our coastal and overseas traffic. Over 600 million tons of commerce were handled through these harbors in 1958.

In the nearly quarter century since the Federal Government assumed responsibility for flood control, the Corps of Engineers has completed or placed in operation 151 multiple-purpose reservoirs and nearly 300 local protection projects for the control of floods. These works already have prevented flood damages of over nine billion dollars to date—approximately three times their total cost. However, the authorized flood control program is as yet scarcely half completed, and the size and cost of the undertaking are increasing with the growth of the country.

The Corps' large multiple-purpose projects, 32 in number, produce a variety of benefits. Over six million kilowatts of hydroelectric power capacity have been installed at them. In 1958 these projects pro-

duced 27 billion kilowatt-hours of power, or about 20 percent of all the hydro-power generated in the United States. Low-cost hydroelectric power from these projects has contributed to the economic growth in many areas, such as the Pacific Northwest.

The Corps of Engineers' reservoirs and other projects provide extra dividends. Opened to public use, they have been turned into a major public recreational resource. Already some three million acres of water area together with 18,000 miles of shoreline are available at normal pool levels for boating, fishing, bathing, camping, picnicking and other recreational purposes. In 1958, Americans seeking recreation, mostly in family groups, paid 95 million visits to these projects—more than double the attendance of five years ago.

Organization

THE civil works program is carried out through the ten Corps of Engineers Divisions in Continental United States, and one in Hawaii, covering the entire geographical area of the United States and its possessions. The Division boundaries generally follow the watersheds of major water courses, with headquarters located in the larger cities. These Divisions exercise supervision over more than forty District offices, which in turn execute the field surveys and supervise construction activities.

In addition to Army Engineer career officers assigned to civil works, there are about 27,000 civilian employees engaged in these activities. Both officer and civilian personnel embrace a large number of the country's outstanding ex-

perts in the field of water resources engineering.

The Corps of Engineers is often called upon to utilize its far-flung organization in catastrophic floods, hurricanes, and civil disasters. (See "Hurricanes and High Water," January 1956 DIGEST.) It also provides support and assistance to the civil defense program, helping to work out plans for expeditious rescue and rehabilitation in the event of nuclear attack.

Whether it is a Texas City explosion, a Montana earthquake

slide, a Gulf Coast hurricane, an Ohio River flood emergency—wherever disaster threatens—there is a Corps of Engineers organization in the area, ready to take on the job of safeguarding life and property.

And now, at the Chicago Museum of Science and Industry, more than 2,000,000 visitors annually will get a first-hand look at the vast diversity of work performed by the U. S. Army Corps of Engineers as it safeguards and develops America's wealth of water resources.

LARC Crosses Lake



FIRST wheeled amphibian ever to cross Lake Michigan was the Army's rugged LARC-15 which one day last summer set off from St. Joseph, Michigan, at 0530 hours and made a safe landing with crew and cargo at Chicago at 1330 hours—a 56-mile voyage. The trip was undertaken for the dual purpose of subjecting the machine to an exhausting engineering test of speed, maneuverability and water-borne stability, and to bring it to the Chicago International Trade Fair where the craft was put on display. Cargo carried was a quarter-ton truck and a Rolling Liquid Transporter. The crew consisted of two technical representatives and four Army men under command of CWO Robert H. Jones, Jr.

**At the Army Signal Training Center, the
Troop Information Office slashed time and effort,
increased interest by presenting**



Sp5 Charles L. Allen, Jr.

WHAT started out as one somewhat tentative newscast over closed circuit facilities of the Southeastern Signal School television studios two years ago today has blossomed into a full-scale Troop Information project, which is paying dividends in better community relations with the area surrounding Fort Gordon, Georgia.

It all began when, in July 1958, French and British forces entered the Suez Canal area. Somewhat hastily, the Troop Information Office got together a five-minute newscast that was put out over the television facilities of the School, to bring news developments to students and permanent personnel at Fort Gordon.

Today there is a daily five-minute newscast that keeps the 7,000 soldiers abreast of current events

Sp5 CHARLES L. ALLEN, JR. is assigned to the Troop Information Office, U. S. Army Southeastern Signal School, Fort Gordon, Georgia.

in a swift-moving world. Further, two 15-minute newscasts precede the weekly televised Troop Information Hour topic. So well have these 15-minute shows and other efforts been received, that dual-purpose presentations have been used by nearby civilian TV stations and radio stations, materially aiding in good community relations.

Using television for troop information is easy because TV is a major activity at this installation where every classroom has a TV set on which instruction is given to supplement lectures. All together 138 sets were available. Two large screen projectors have been made available for theater showings.

Then and Now

PRIOR to employing TV for the Troop Information Hour (TIH), pamphlets had to be reproduced and distributed to instructors and overhead units. Film schedules had to be arranged. All this activity was

extremely time-consuming. Today, use of TV has cut preparatory man hours about eighty percent, and the TIH is better presented with a further saving of paper and training aids.

First use of television for the Troop Information Hour started in January 1959 when the school studios kinescoped four advanced individual training topics—*Citizenhip Our Heritage, International Communism, Communism in the United States, and Defense Against Enemy Propaganda*. So well produced were these efforts that they are still shown to all incoming ASTC personnel.

At the outset, since there was no reproducing device, it was necessary to repeat a live program four times for TV presentation. However, with acquisition of a video tape recorder, a whole new concept of troop information opened up.

A study of schedules showed that the entire command could be given the Troop Information Hour in two hours each week. Video tape made it possible to produce a show at convenience of the studios and participants, thus providing a wider range of coverage.

Use of tape also makes it possible to record interviews with visitors which can be used at any convenient time. On one occasion Mr. James Hagerty, presidential news secretary, spoke. Edison Marshall, author, informally chatted with the educational director on a reading program for students. These and other similar programs were exceedingly effective.

Present Program

THE Troop Information Hour

itself now is produced in three parts. After a program has been taped, an introduction is prepared for each classroom instructor. He delivers this as a "warmup"—a practice which helps retain his personal contact with the class. Then comes a 15-minute news summary—five minutes of national news, eight of Signal Training Center news, and two of weather. The national news is prepared from press service radio wire reports received by teletype. Presentation of the actual Troop Information topic then follows.

Shortly after video tape was put into operation, a series of three programs on Augusta-Fort Gordon community relations was worked out. These were broken down into *Cultural and Recreational Relations, Economic Relations and Spiritual Relations*. A panel of five Augusta citizens prominent in each area discussed the particular topic with two enlisted men, while the three major ASTC commanders appeared as hosts. Two of these shows later were presented over WRDW-TV in Augusta, thus advancing community relations along with troop information.

Later *Project Good Neighbors* was produced to emphasize what Fort Gordon had done and could do for Augusta. Three prominent Augusta citizens appeared with the three major Fort Gordon commanders. The presentation was shown on local TV stations, on the Troop Information Hour, and also was audio taped and broadcast over five local radio stations. More such dual-purpose programs now are being planned, to advance TI and community relations through TV.

NEWS

of professional interest

R&D Authority

Increased authoritative direction and control of all Research and Development functions and installations used primarily for such purposes have been vested in the Chief of Research and Development, Lieutenant General Arthur G. Trudeau. The readjustment of functions and responsibilities affecting the Chief of Research and Development and the Deputy Chief for Logistics was announced by Secretary of the Army Wilber M. Brucker.

Control over the R&D area in each of the Technical Services will be exercised hereafter by the Chief of R&D through the Chiefs of the Technical Services. Line of authority and responsibility from Chief of R&D to the Chiefs of the Technical Services will parallel the existing line of authority and responsibility from the Deputy Chief of Staff for Logistics to the Technical Services on matters pertaining to logistics. Under supervision of the Director of Research and Development, Richard S. Morse, the Chief of R&D now assumes responsibility for planning, co-ordinating, directing and supervising all Army research, development, test and evaluation including all controls over policies, funds, activities and facilities essential to discharge of this responsibility.

Nike-Hercules Mobility Kit

Development of the M94 Field Installation Kit will allow utilization of Nike-Hercules air defense guided missiles as mobile weapons for fast-moving field armies. The new kit will allow the 39-foot (with booster) surface-to-air missile to be moved and fired without use of a concrete pad. This will give field armies a high altitude defense capability and will supplement the low-level Hawk.

Nike-Hercules has a range of over 75

miles, can reach up over 150,000 feet, can carry either a conventional or nuclear warhead. The M94 kit consists of a blast deflector and its tie-downs, hydraulic jacks and outriggers, and a removable undercarriage for transporting the launcher. Douglas Aircraft Company will produce the kit for the Army.

USAREUR Assignment

An experimental plan for assignment of officers from duty stations in the United States to an oversea unit has been put into effect. The plan is limited to officers selected for assignment to U. S. Army, Europe. Basic objective is to test and develop a system whereby officers are provided a unit of assignment at least 90 days in advance of port date. A further objective is to insure that the greatest number of those selected for oversea movement receive permanent change of station orders at least 120 days prior to leaving home stations. Details of the personalized officer assignment plan are set forth in AR 612-105, 5 August 1960.

Arlington Cemetery Expanded

Expansion of Arlington National Cemetery through use of the 190-acre tract now designated as the South Post of Fort Myer is scheduled to begin by Fiscal Year 1964. When complete, the development and the use of the area will extend the active life of the National Cemetery until about 1979.

Present area of the cemetery includes 419.47 acres, of which 80.36 are still undeveloped. Since it was established in 1864, more than 105,000 burials have been made. Projecting rate of grave site use into the future, it was estimated that all space in the existing area of the cemetery would ordinarily have been occupied or reserved by 1967.

Pershing Training

The first class to receive training on the new Pershing ballistic missile is underway at the Army Ordnance Guided Missile School, Huntsville, Alabama. The Pershing ballistic missile is slated to succeed Redstone in support of field troops. Included in the first class are 40 officers and key civilians from Ordnance commands and arsenals. They will be responsible for supervising the new system through stages of manufacture, maintenance, funding, personnel training and deployment. All together, about 400 selected students will attend the classes.

Aircraft Maintenance Hangar

User tests have begun of a portable aircraft maintenance hangar that is supported by air-pressure and a lightweight metal frame, developed by the Army Quartermaster Corps for servicing Army aircraft in the field. The new hangar is half-oval, 80 by 72 feet, stands 36 feet high at the center. It consists of a fabric "skin" over

an auxiliary semi-rigid frame. Either end of the shelter can be opened, eliminating door hazards and reducing wind load. It is inflated by a small blower. When open to receive aircraft, pressure is lost and the "skin" is supported by the frame.

Completely portable, the unit weighs 7,400 pounds, can be transported by a 2½-ton truck or cargo aircraft. Simple in design, it can be assembled without special tools, training or skills. Besides its primary use, it is expected to prove useful as a shelter for field bakery, theater, warehouse or recreation center. It was designed jointly by the Quartermaster Corps and Birdair Structures, Inc., Buffalo, New York.

Airborne Surveillance

Newly developed side-looking airborne radar (SLAR) will be placed in eleven Army L-23D twin-engine "Seminole" aircraft. The new equipment permits radar photographs to be taken under all weather conditions while flying parallel to the area to be scanned.

Night Vision for Infantry and Armor

DESIGNED to fit most individual weapons, a new lightweight sniperscope sight has been announced by the Army Engineer Research and Development Laboratory. Known as the T-1, the infrared gunsight shows a target image twice as large as the World War II version, to provide better identification of objects in the dark. The new sniperscope weighs only 13 pounds, compared to the older 28 pound model. It is powered by a unit, only one-eighth the size of the former one, which can be hooked on a cartridge belt to eliminate a back-carried battery supply load.

World War II sniperscopes, with the power supply permanently attached, sent out their own infrared signals which helped enemy detectors locate the users. Today a central infrared searchlight can spray a wide battlefield with infrared light. The T-1 equipped rifleman simply unhooks the power supply and uses the lightweight receiver portion only—keeping himself hidden from enemy detectors.

The improved sniperscope was developed for the Army Engineer Research and Development Laboratory by Raytheon Company, Waltham, Massachusetts.

A NIGHT-seeing kit composed of searchlights, periscopes and binoculars for use in tanks is under development at the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Virginia. The instruments are designed to enable tank operators to observe the enemy by using either visible or infrared light.

The searchlight, an infrared-visible xenon unit, operates in unison with the tank gun. It emits infrared radiation which reflects off objects which then can be detected by the binoculars or the periscopes. The gunner's periscope has both wide angle and high magnification channels using ordinary light and high magnification channels using infrared, while the commander's infrared periscope provides him with a closed hatch infrared viewing capability.

The searchlight was built under contract with the Laboratories by General Electric Company, Hendersonville, North Carolina; the periscopes by Perkins-Elmer Corporation, Norwalk, Connecticut; and the binocular by Wollensak Optical Company, Rochester, New York.

One Army Contest

A ONE ARMY essay contest, open to all military personnel of the Active Army, Army National Guard, Reserve, ROTC and West Point Cadets, is being sponsored world-wide by the Association of the U.S. Army. Savings Bond prizes of \$500, \$200, \$100 and ten fourth prizes of \$25 bonds will go to winning essays on the general subject, "One Army—An Essential Force for Freedom."

Contestants will be permitted wide latitude in developing the theme. As a guide any or all of the following may be included: (1) importance of the One Army philosophy to the national defense effort; (2) the contribution which One Army programs have made to national defense; (3) examples of any manner in which military preparedness of Army forces may have been improved as a result of the program; (4) any recommended actions for giving further emphasis to the One Army philosophy among the three components of the Army; (5) an exposition of the meaning of "One Army" to the writer.

Essays, restricted to 500 to 800 typewritten words, must have a cover sheet with the author's name, rank, serial number, unit or address, and should be postmarked no later than midnight, 1 January 1961. AUSA employees and Army personnel directly involved in planning any portion of the One Army Program are ineligible. Entries should be addressed to One Army Contest, Association of the U.S. Army, 1529 18th Street, N.W., Washington 6, D. C.

Pacific Missile Range

In preparation for experiments with radar systems of advanced design and other sensing devices to be installed on Roi-Namur islands in the South Pacific, a contract for \$1,000,000 has been awarded by New York Ordnance District to Western Electric Company for submarine cables linking Kwajalein and Roi-Namur. Known as Project Press (Pacific Range Electro-Magnetic Signature Study), the experimental program is designed to study detection and identification of ballistic missile warheads. The entire program is part of Project Defender, administered by the

Advanced Research Projects Agency of the Department of Defense.

The U. S. Army Ordnance Missile Command is acting as ARPA's executive agent for Project Press. Responsibility for installation of equipment and carrying on the experiments has been assigned to the Army Rocket and Guided Missile Agency. The 55-mile cable, to be used for communication and data transfer, will be laid by the Albert J. Myer of the Army Transportation Corps, which also will be laying submarine cables of the same type for the Nike-Zeus system tests in the Kwajalein atoll.

For your convenience, you may send the Digest home . . .

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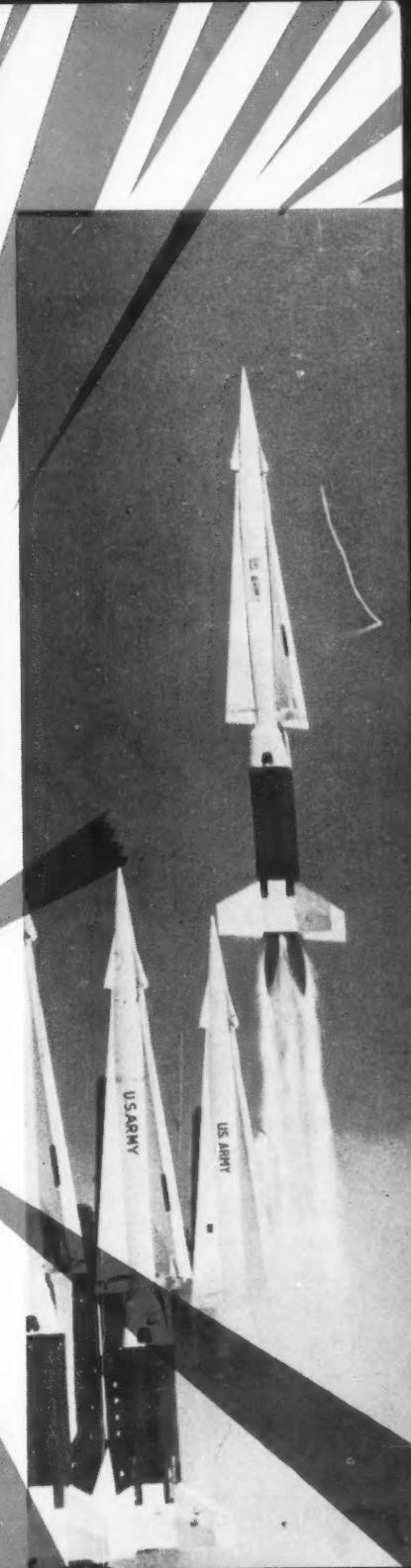
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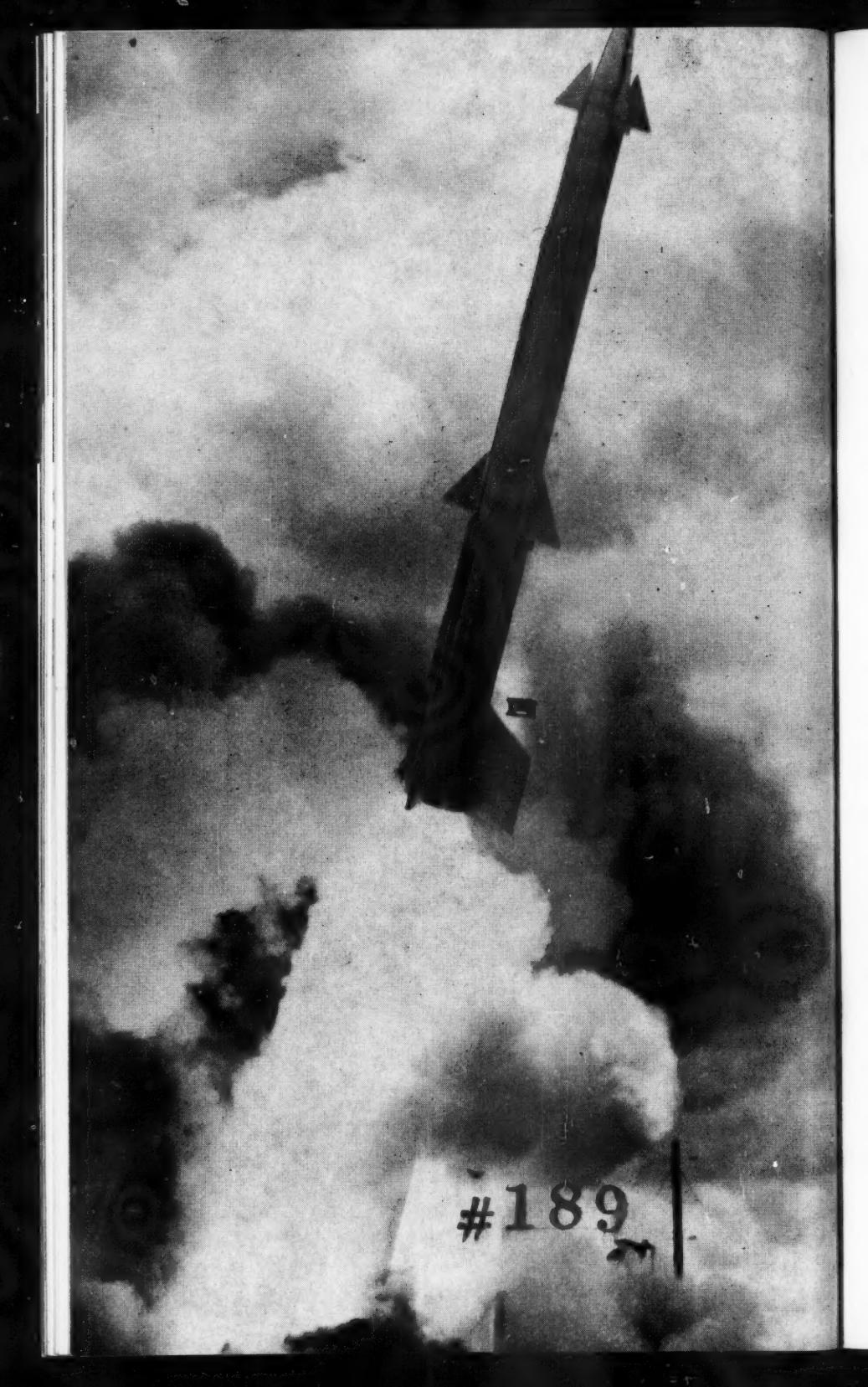
DIGEST.

Nike-Hercules Scores Another Kill

IN THE rarefied air at 19 miles above the earth's surface two Nike-Hercules missiles, approaching each other at combined speeds exceeding seven times the speed of sound, show up as blips on radar screens at White Sands Missile Range, New Mexico. One blip moves from the north, the other from the south. Their paths converge. There is an explosion, a blinding flash, unseen from so far below but captured on moving picture film (*see above*).

In the toughest test to date, the Army's improved Nike-Hercules guided missile system again demonstrated its anti-missile capability as one Hercules destroyed another in the highest known kill of a fast moving target. Previously an improved Hercules had scored the first known kill of a guided ballistic missile when one destroyed a Corporal missile. (See "Missile vs. Missile," September 1960 DIGEST.)





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